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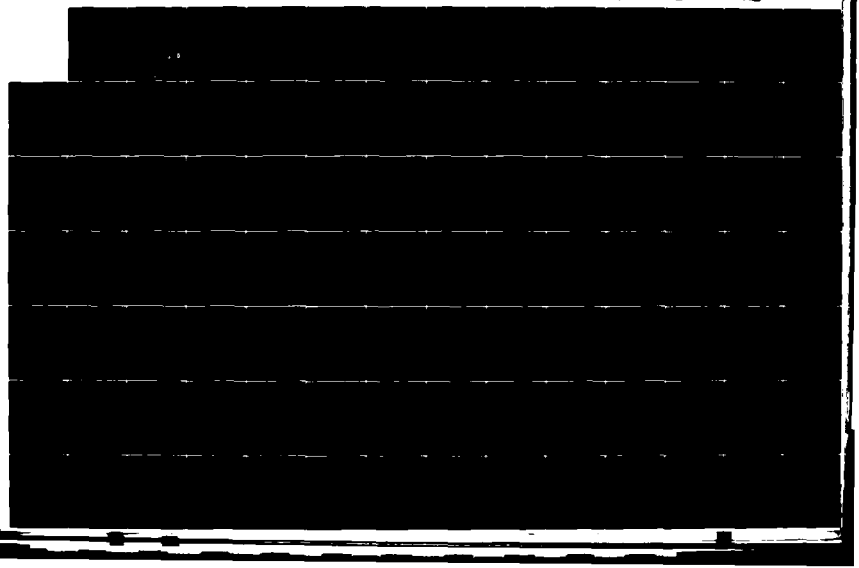

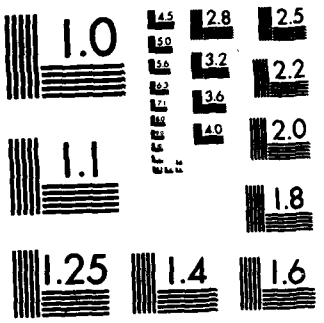

AN ELECTRONIC FUTURE FOR DEFENSE TRANSPORTATION MANAGEMENT

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Executive Summary

AN ELECTRONIC FUTURE FOR DEFENSE TRANSPORTATION MANAGEMENT

Paper has long been the standard medium for recording and communicating transportation transactions in the Department of Defense. Paper's time has now passed; the future is in electronics.

Successful private-sector firms conduct much of their transportation business electronically. They use techniques generally referred to as electronic data interchange (EDI) to improve productivity, reduce staffing, and strengthen financial control. The same payoffs are available to DoD's transportation activities.

To obtain those payoffs, however, DoD needs to undertake six major initiatives simultaneously:

- Establish an EDI Program Office to coordinate entry into an electronic environment. Private companies have found such an office vital to improving transportation operations.
- Upgrade the electronic processing capabilities at DoD payment centers. Most early gains will be made there.
- Install EDI capability at 145 of the largest shipping activities. They account for more than 85 percent of all cargo movements and are essential to a successful EDI program in Defense transportation.
- Coordinate the development of automated systems within the Military Services, Defense Logistics Agency, Military Traffic Management Command, and General Services Administration. This will permit the receipt and processing of electronic information.
- Configure a telecommunications network linking shippers, consignees, commercial carriers, payment centers, and other transportation activities. Include, as part of the network, commercial telecommunication services.
- Modify Federal regulations and DoD directives and instructions that inhibit DoD from conducting its transportation business, both domestic and international, electronically. Replace, update, or eliminate paper-oriented practices.

These initiatives, reinforced by clear, supportive guidance from the Office of the Assistant Secretary of Defense (Production and Logistics), can launch a successful, long-range EDI program for Defense transportation.

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CHAPTER 1

INTRODUCTION

BACKGROUND

In a previous study,[1] the Logistics Management Institute (LMI) found that most of the automated data processing systems supporting transportation management within DoD were old and operated on hardware that ran at or near capacity. We also found that all major transportation organizations within DoD were developing replacement systems, many of which will become operational in the late 1980s and early 1990s.

While the replacement systems will correct some of the shortcomings in the current systems, most will not have the capability to transfer transportation information electronically from one computer to another. Yet, this type of business information is already being electronically interchanged in the private sector, and such electronic data interchange (EDI) promises to become the standard for conducting business in the future.

To assure that the next generation of automated data processing systems can accommodate electronic interchange, the Assistant Secretary of Defense (Production and Logistics), ASD(P&L), initiated a test to demonstrate the feasibility of using EDI techniques in Defense transportation.[2] That test concentrated on the electronic exchange of Government bills of lading (GBLs) and freight invoices. It used existing industry standards that defined formats for the data being exchanged as well as commercially available software and telecommunications services.

The results of the test showed that the application of EDI can yield considerable benefits for DoD transportation activities: reduced clerical effort, greater accuracy, and more timely information. They also showed that in order for DoD to

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[1]LMI Report ML424. *DoD Cargo Management Systems*. Heard, Thomas W., and Robert F. Rozycki. August 1985.

[2]LMI Report ML538. *Electronic Data Interchange in Defense Transportation*. Heard, Thomas W., and William R. Ledder. October 1987.

obtain the full benefits of EDI, many of its transportation activities – shippers, consignees, payment centers, and Military Traffic Management Command (MTMC) – would have to change their operations substantially. Those changes include realigning organizational and functional responsibilities and changing business methods, operating procedures, and control processes.

REPORT ORGANIZATION

Based on the results of the DoD EDI test, we concluded that before a comprehensive EDI program can be initiated for Defense transportation, the ASD(P&L) must develop a deliberate and thorough long-term program. We have developed such a program and present it in Chapter 2.

In Chapter 3, we propose the initial focus of that program. We show that the same characteristics that led private-sector shippers to concentrate their short-term efforts on freight payment applications also exist in the DoD transportation environment. Chapter 3 also presents the short-term operating concept, covering 2 to 5 years; recommends and describes implementation actions that should be undertaken immediately; and examines in general terms the expected costs and benefits of the short-term program.

Chapter 4 presents our recommendations for moving Defense transportation from a paper-intensive environment to one in which business is transacted electronically. The report concludes with seven appendices that present in more detail the information upon which our recommendations are based.

CHAPTER 2

LONG-TERM EDI PROGRAM FOR DEFENSE TRANSPORTATION

Drawing upon the results of DoD's test to demonstrate the feasibility of exchanging transportation information electronically, this chapter presents a long-term comprehensive EDI program to support DoD freight movements. Although we present some of the details supporting the plan in this chapter, most are in the appendices.

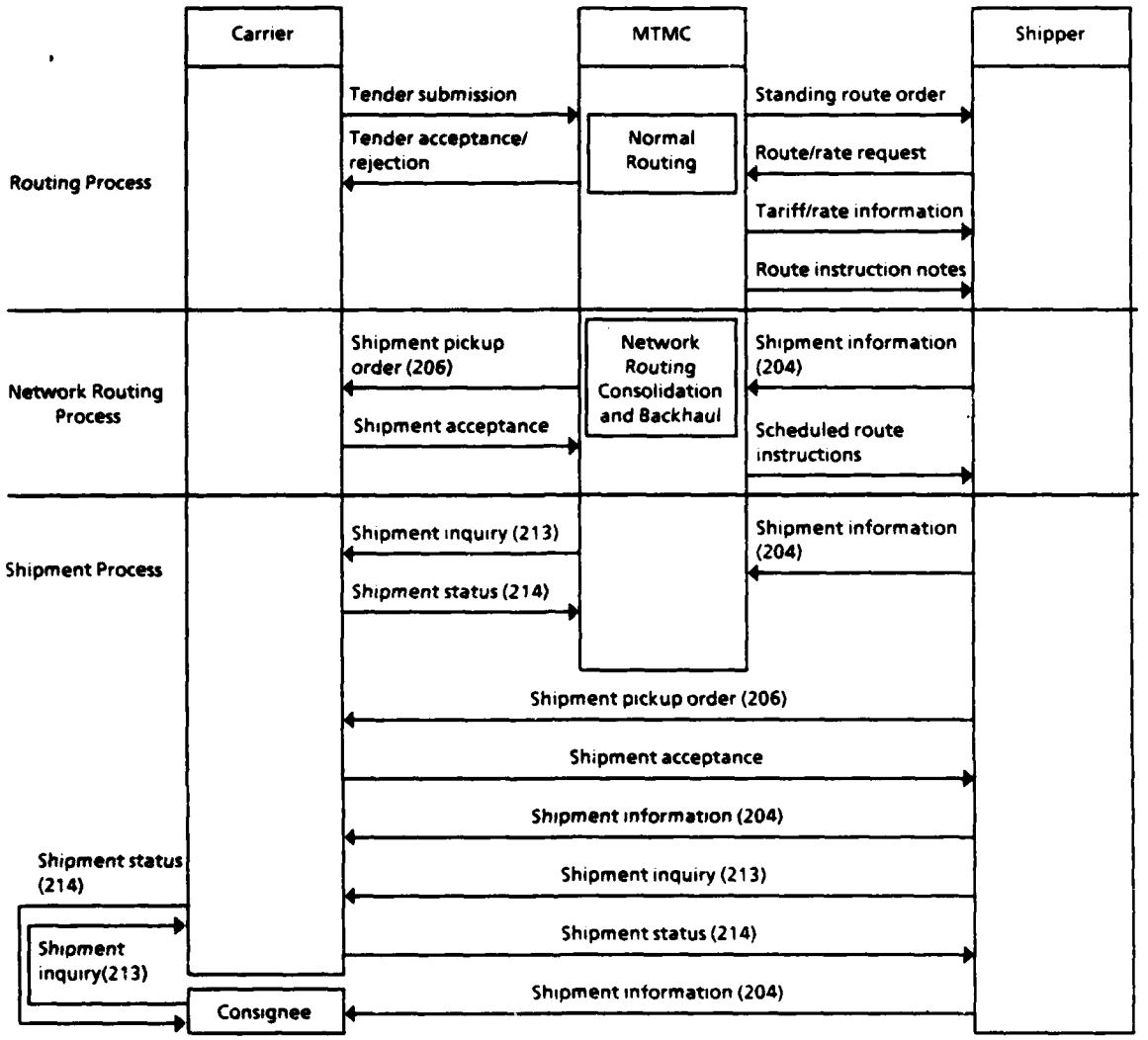
BUSINESS INFORMATION FLOWS

Any EDI planning effort must necessarily start by identifying major business information flows between internal and external business trading partners. It must also seek to anticipate altered or additional information flows that would be required in a paperless environment.

Our examination of the information exchange requirements for freight movements shows 39 routine business information flows among DoD organizations, commercial carriers, and banks. These information flows can be grouped into five processes: routing, shipment, audit and payment, claims, and transportation management. The information flows in these processes are shown in Figures 2-1, 2-2, and 2-3, and the processes are briefly described in the following paragraphs. (Appendix A presents more detailed descriptions of each information flow.)

The routing process (Figure 2-1) includes 10 separate information flows between the shipper and the carrier related to rate management and carrier selection. Rate management encompasses the submission of tenders by carriers to MTMC and the transfer of traffic rates from MTMC to shippers as an aid in carrier selection. In the private sector, the routing process is being expanded to include network routing, which concentrates on consolidating freight into more economical truckloads and taking advantage of backhaul opportunities to reduce transportation costs.

The shipment process (also shown in Figure 2-1) involves a variety of communications between shippers, MTMC, consignees, and carriers. They include requests

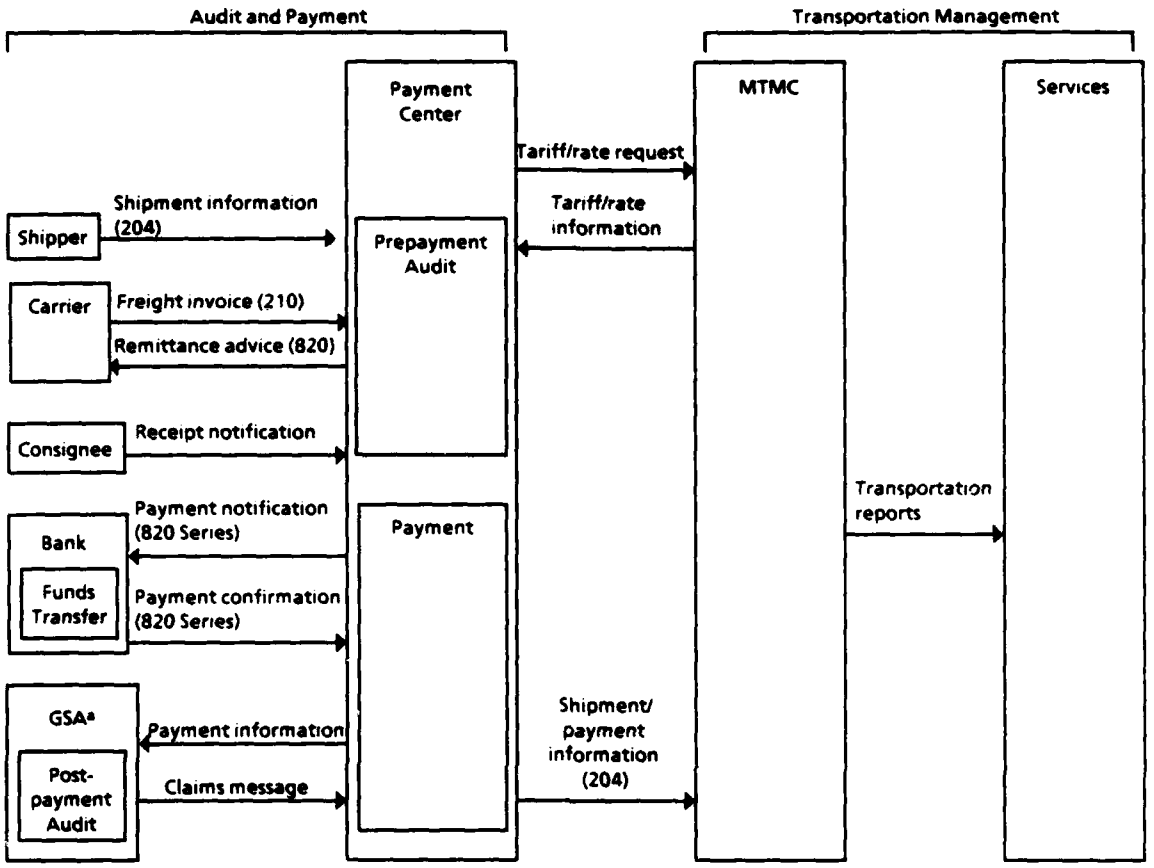


Note: The 21 business information flows are shown as arrows; the 12 existing commercial standards are shown in parentheses.

FIG. 2-1. ROUTING AND SHIPMENT PROCESSES

for transportation, acceptances from carriers, inquiries from shippers, and various exchanges of shipment information.

The audit and payment process (Figure 2-2) includes such functions as information processing, rating, reconciliation, and paying. The audit function can be further broken down into prepayment and postpayment audits. Information processing includes all the functions associated with data input, transmission, and



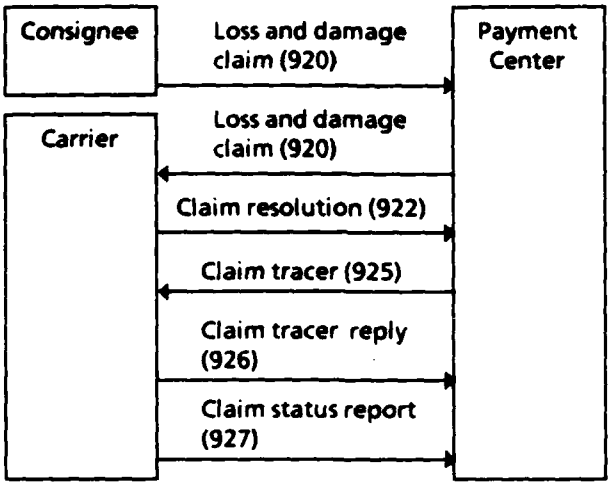
Note: The 12 business information flows are shown as arrows; the 6 existing commercial standards are shown in parentheses.

[a]GSA = General Services Administration.

FIG. 2-2. AUDIT, PAYMENT, AND TRANSPORTATION MANAGEMENT PROCESSES

validation; rating involves extending freight rates by the number of units of freight to determine appropriate charges; reconciliation is matching the shipper's shipment information with carrier's invoices and resolving any discrepancies; and paying encompasses all the communications among payment centers, carriers, and banks regarding the actual payment of freight invoices.

The transportation management process (also shown in Figure 2-2) involves information flows in support of developing and maintaining transportation databases to support performance review and reporting initiatives.



Note: The 6 business information flows are shown as arrows; the 6 existing commercial standards are shown in parentheses.

FIG. 2-3. CLAIMS PROCESS

The claims process (Figure 2-3) involves all the transactions related to the resolution of freight discrepancies, including overages, shortages, and damages. The transactions include loss or damage notification, claim resolution, claim tracing, and claim status.

For some of the flows, a commercial standard – which defines the format and data requirements for a specific business transaction – has already been developed by the Transportation Data Coordinating Committee (TDCC).[1] The numbers in parentheses in the figures indicate the specific TDCC commercial standard (or transaction set) that corresponds to the business flow. For example, 204, which appears on several flows, indicates TDCC's Transaction Set No. 204, *Shipment Information – Motor.* (That standard was used in DoD's recently completed test to demonstrate the feasibility of exchanging GBL and freight invoice information electronically.)

The importance of commercial standards lies both in their existence – considerable effort, coordination, and time are required to develop standards – and

[1]The TDCC has produced industry-accepted standards for the rail, motor, air, and ocean transportation modes. Most of the transaction sets, or standards, shown in Figures 2-1, 2-2, and 2-3, are related to the motor carrier industry. Similar standards exist for each of the other modes.

their acceptance and use by the private sector. As Figures 2-1, 2-2, and 2-3 show, the private sector, particularly carriers and banks, are key players in DoD's transportation operations. As such, the standards DoD uses in exchanging transportation information must be in concert with those being used in the private sector.

LONG-TERM PROGRAM

DoD's long-term EDI program for freight movements should encompass most of the business information flows shown in Figures 2-1, 2-2, and 2-3. This section presents a concept of operations that addresses system development and communications issues. In developing that concept, we recognize that the use of paper documents for some amount of business information will continue.

Systems Development and Communications

The long-term operating concept shown in Figure 2-4 shows electronic and paper business information exchanges flowing through a proprietary communications network – a value-added network, or VAN – and a commercial communications network. The proprietary communications network enables DoD activities to communicate with each other. The public VAN enables commercial carriers and banks to communicate with the payment centers and MTMC.

The concept also shows a direct communications link between two major systems: MTMC's CONUS Freight Management (CFM) system and the payment centers' audit and payment systems.[2]

CONUS Freight Management System

The CFM system is a key element in DoD's long-term EDI program. Although still in the developmental stage, the CFM design and operating concept calls for a DoD-wide centralized automated freight management system that will perform six primary functions: (1) route domestic freight shipments, (2) support the prepayment audit of GBLs, (3) provide rate-quoting services, (4) monitor commercial carrier

[2]DoD uses three payment centers for paying freight bills and other related transportation charges: the U.S. Army Finance and Accounting Center's (USAFAC's) Transportation Operations Directorate; the Navy Material Transportation Office (NAVMTO); and the Marine Corps Transportation Certification Branch (TVCB). Because USAFAC pays Army, Air Force, and Defense Logistics Agency (DLA) freight bills, it is the largest payment activity; it pays more than four out of five DoD freight bills.

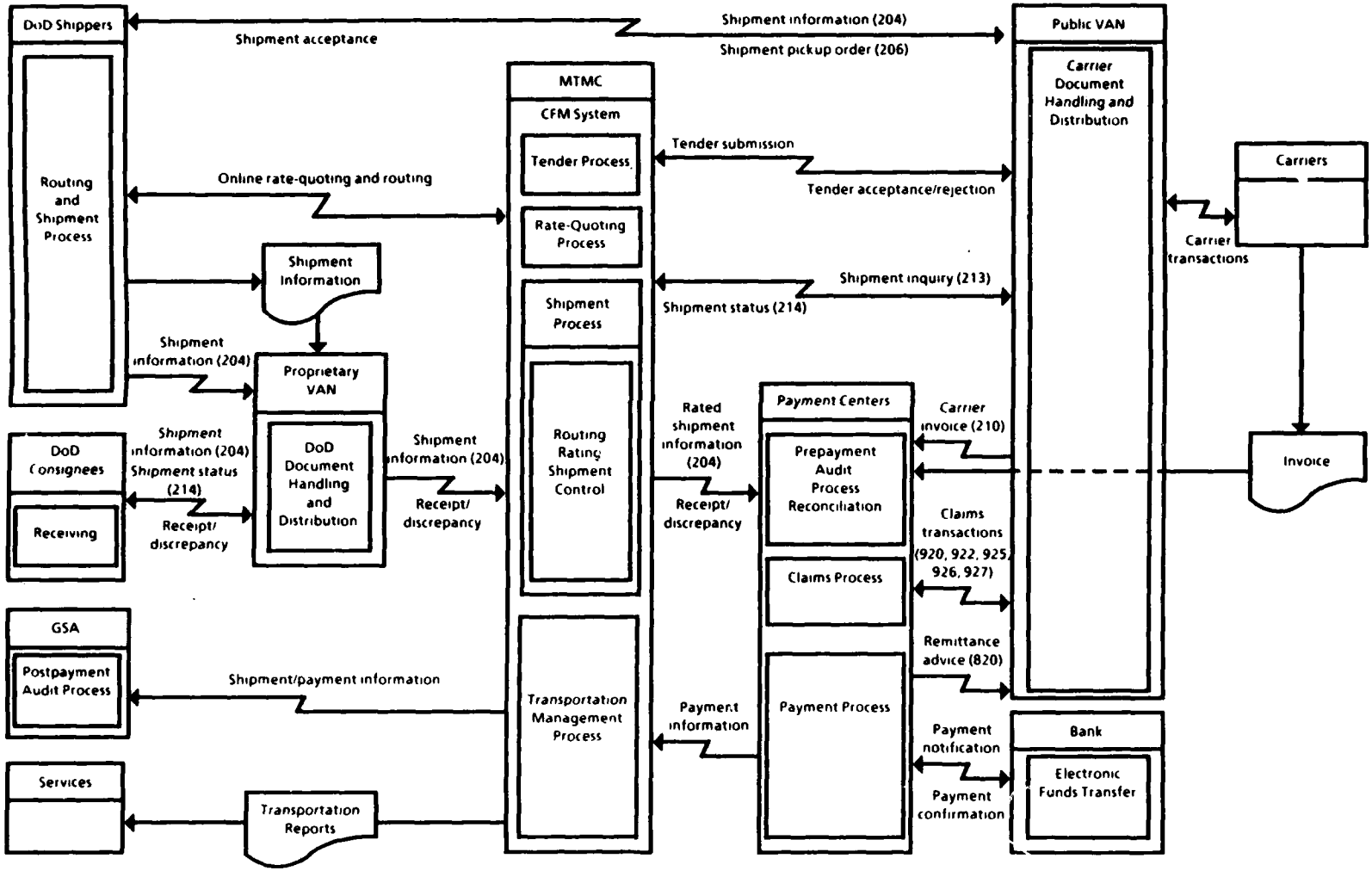


FIG. 2-4. LONG-TERM OPERATING CONCEPT

performance, (5) monitor the efficiency of the entire domestic freight traffic system, and (6) provide support to the Joint deployment community during contingencies.

The CFM system design concept calls for extensive use of the electronic exchange of transportation business information among DoD transportation activities. The design calls for using the Defense Data Network (DDN) for communications and a proprietary VAN for receiving, processing, and forwarding electronic information. The CFM's network service is expected to provide both online access to each user's automated data processing systems and electronic store-and-forward or store-and-retrieve capabilities. In the private sector, these two different types of communication arrangements are commonly referred to as *online EDI* and *batch EDI*.

The CFM design concept requires significant systems development efforts to upgrade MTMC automation. It calls for designing, building, and installing automated systems for both the shipping and receiving functions at Installation Transportation Offices. These developmental efforts, when combined with CFM's communications efforts, will permit extensive electronic exchange of transportation business information among DoD shippers and receivers, MTMC, DoD payment centers, the General Services Administration (GSA), and commercial carriers.

Audit and Payment Systems

A key action in the long-term DoD EDI program is the enhancement of the payment centers' auditing and payment capabilities so that they can accommodate the electronic exchange of transportation business information. Today, those centers operate in a paper- and people-intensive environment. They require commercial freight carriers to submit a public voucher with original GBLs attached. Together, those papers serve as source documents for information to process payment, and they provide a control system to ensure that the transportation services were procured by a DoD shipping activity.

In the long-term EDI program, freight bills or invoices are submitted electronically, a common practice in the private sector today. Although the technology involved in the electronic exchange of invoice data from carriers to payment centers is straightforward, maintaining the necessary financial controls is not. To maintain that control, DoD shippers must position information on all GBL shipments at the payment centers. Then, as the payment centers receive invoice information

electronically from the carriers, they must reconcile those invoices against the pre-positioned shipment information. Because the pre-positioned shipment information must flow from numerous DoD shipping points to the payment center – a process not required in today's paper environment – the impact on DoD's payment operations is dramatic. Payment centers will need to reorient their operations and develop automated systems to receive and reconcile invoices against pre-positioned shipment information.

Summary

DoD's long-term EDI program hinges on two major systems development efforts: MTMC's CFM system and the payment centers' audit and payment systems. These efforts need to be closely coordinated since numerous interfaces exist between the two. System designers and developers as well as other organizations, notably GSA and the Military Services, will need to agree on general operating concepts and procedures.

Information Flow Processes

In the long-term EDI program, the operating concepts are described by the five information flow processes: routing, shipment, audit and payment, claims, and transportation management.

Routing Process

The routing process includes two subprocesses: the tender process and the rate-quoting process.

The tender process involves two major electronic information exchanges between MTMC's CFM system and commercial carriers: a tender submission and a tender acceptance or rejection. The tender is submitted electronically by carriers to MTMC's CFM system, and in turn, MTMC sends electronic tender acceptance or rejection information back to the carriers.

As shown in Figure 2-4, all electronic communications to or from external business partners (e.g., commercial carriers and banks) are conducted over networks provided by commercial telecommunication vendors. Those networks, also known as "third-party" or "value-added" networks, provide communications services for electronic trading partners.

The rate-quoting process comprises at least two information exchanges: a rating request exchange and a rating information exchange. MTMC's CFM operating concept calls for shippers and procurement activities to have online access to a CFM rate-quoting process and to receive rating information on a real-time basis.

Shipment Process

The shipment process consists of three subprocesses: routing, shipment control, and rating.

The routing process is essentially the same as the rate-quoting process. In the CFM operating concept, shippers can access CFM's rate-quoting process for rates and shipment routing (i.e., carrier selection).

The shipment control process is a critical component in the long-term EDI program. In this process, DoD shippers send GBL shipment information electronically to the DoD proprietary service network – the VAN – using batch EDI techniques. The VAN processes and distributes this information to both consignees and the CFM system. The shipment information is processed by customizing data sets from the shipment information transaction set to meet consignee and CFM information requirements. The information is distributed using store-and-forward or store-and-retrieve techniques.

DoD consignees receive shipment information from the CFM system through the proprietary VAN. This electronic notification of shipments that are due in provides better control over lost or astray shipments. As consignees receive shipments, they send electronic receipt or discrepancy information to the proprietary VAN, which in turn, distributes that information to the CFM system.

As indicated, the CFM system receives both shipment information and shipment receipt and discrepancy information from the VAN. That shipment information is then used to create a shipment-in-process file that provides in-transit shipment visibility and, when combined with shipment receipt or discrepancy information, better shipment control.

Ultimately, shipment information and receipt information are combined and stored in CFM's central database; the combined data are also sent to the payment centers. The information stored in the CFM database awaits payment information

from the payment centers to complete the shipment history and form the foundation for the transportation management process.

It is important to recognize that even in the long run, not all DoD shippers and consignees will be able to interface electronically with the proprietary network and, therefore, with the CFM. (For example, more than 700 DoD shippers average less than five shipments a day, and providing EDI capability to those shippers may not be economically justified.) Our long-term EDI operating concept, recognizing this problem, calls for nonautomated shippers to send shipment information to MTMC on a paper document. MTMC captures portions of that information to enable the CFM to process all DoD shipment information and, after shipment rating, sends it electronically to the payment centers.

The rating process builds on the shipment control process by providing rating information for each shipment. This rated shipment information is then sent electronically to the payment centers for auditing and payment.

Auditing and Payment Process

The auditing and payment process comprises three subprocesses: prepayment audit, payment, and postpayment audit.

The prepayment audit process at the payment centers involves two activities: rating shipments before payment and reconciling carrier invoices against rated shipment information. Under MTMC's CFM operating concept, rated shipment information is sent electronically to the payment centers. Alternatively, the payment centers could have access to the CFM rate database and rate the shipments themselves. Regardless, the objective is to ensure that the carriers receive the correct payment -- carriers are currently overpaid by an estimated $40 to 50 million a year.

The prepayment audit process also reconciles carrier invoices against rated shipment information. In the long term, the vast majority of carrier invoices will probably be submitted electronically; however, some carriers are unlikely to make the investment in EDI systems that permit electronic invoicing. Consequently, payment centers need to orient their operations and data processing systems to receive and process both electronic and paper invoices. As shown in Figure 2-4, we expect electronic invoices from carriers to be communicated to payment centers over

public VANs. For the paper invoices, payment centers will need to capture invoice data for the payment operations.

The actual reconciliation process, critical to maintaining financial and operating controls, involves matching invoice data against the rated shipment information. Major private-sector shippers are doing this today. Their experiences indicate that successful reconciliation occurs at a rate of 95 percent or better. For those invoices that cannot be reconciled, payment center personnel either work with carriers to resolve the discrepancies, pay the invoiced amount and recover overcharges in the postpayment audit cycle, or pay the amount calculated through prepayment rating.

Interestingly, some companies are exploring an operational concept in which invoicing is eliminated. They believe that since a freight payment operation has an electronic record that a shipment was made, has another electronic record that the shipment was received, and has the ability to accurately rate or calculate the charges due, why not pay the carrier without an invoice? That procedure reduces the expenses associated with receiving and processing invoices as well as shifts the burden of auditing to the carrier. Although feasible, we believe DoD payment operations should first implement the operating concept we have described and at a later date explore the possibility of eliminating the carrier invoicing function.

The payment process in the long-term operating concept encompasses electronic funds transfer (EFT) between DoD's payment centers and commercial banks. Although in the early stages of development, a major pilot test among General Motors Corporation and eight banks is proving the feasibility of EFT. We believe that EFT will become the preferred method for accomplishing payments over the next several years. Although EFT is primarily an EDI issue for the DoD financial community, it is also a natural extension of Defense transportation EDI efforts.

The postpayment audit process is the last of the audit and payment processes. Even though the long-term concept calls for prepayment auditing, we believe that freight bills should be subjected to postpayment auditing as a check on the accuracy and performance of prepayment audits. Most large private-sector shippers find such a process to be economically justified.

Since GSA currently performs the postpayment auditing function, our long-term concept calls for payment information to flow electronically from the payment

centers to MTMC's CFM system; there it is combined with the shipment information received from DoD shippers and then forwarded electronically to GSA.

Claims Process

The claims process involves the electronic exchange of information between the payment center and a carrier to resolve freight discrepancies and damage. As seen in Figure 2-4, five TDCC standards are available for exchanging that information.

Transportation Management Process

As discussed, the long-term operating concept calls for shipment, receipt, and payment information to flow electronically to MTMC's CFM system. When combined, that information provides a history of freight transportation activity and can be used for transportation analysis and management reporting. We expect that the Military Services, as well as specific commands, will be able to access and query this database as well as receive structured management reports electronically.

RELATED PROGRAMS

Our long-term EDI program addresses the electronic exchange of business information for one segment of Defense transportation – CONUS freight movements. Similar opportunities exist for other segments of Defense transportation including international and personal property movements. We envision DoD's long-term EDI program encompassing the electronic exchange of business information for those movements as well. Several recent related initiatives bear discussion.

Modernization of Defense Logistics Standard Systems

The Modernization of Defense Logistics Standard Systems (MODELS) program is perhaps the largest DoD EDI effort, and a portion of that effort is related to transportation. Essentially, the MODELS program seeks to upgrade existing but outdated logistics electronic communications capabilities. Specifically, a new communications network with multiple logistics gateway nodes will be developed to replace the existing two Defense Automatic Addressing System facilities that perform the routing and interfacing functions required to achieve interoperability among the various logistics systems.

In addition, the MODELS program will develop new standards to replace the existing standards used for communicating acquisition, supply, transportation,

maintenance, finance, and other business information. The old standards, known as the Defense Logistics Standard Systems (DLSS), are based on 80-column fixed-field formats, are difficult to modify, and do not address all the logistics information exchange requirements. As an example of the latter shortcoming, the current DLSS are oriented to DoD's international transportation requirements (overseas shipments), whereas CONUS transportation requirements (domestic shipments) for information exchange are specified by MTMC through the Defense Transportation Management Regulation, which is oriented exclusively to paper. For the latter, no electronic standards have been formulated.

The new MODELS standards will be designed using the basic structure and architecture that commercial industry groups have used to create electronic standards for intercompany business information exchange. They will also be expanded to include information requirements and standards that are not currently covered by the DLSS, such as CONUS and in-theater movements.

In summary, the MODELS effort is a major endeavor to upgrade logistics policies, procedures, and electronic communication capabilities. At its foundation is the use of EDI concepts and techniques. Ultimately, the long-term EDI implementation plan for CONUS freight movements needs to be coordinated closely with the MODELS program to develop common standards and share communications network facilities.

Automated Carrier Interface

The Automated Carrier Interface program provides for an electronic linkage between MTMC and ocean carriers. In the first phase, now under way, container shipments are offered and booked electronically. The second phase, under conceptual development, involves electronic inquiry and status reporting on container movements within the transportation pipeline. The third phase envisions the electronic submission of carrier invoices. Once again, opportunities exist for sharing communication facilities and developing common standards.

Transportation Operational Personal Property Standard System

The Transportation Operational Personal Property Standard (TOPS) system is an automated system to assist installation transportation officers in routing, processing, and managing personal property shipments. When implemented, TOPS

will permit business information to be exchanged electronically over DDN communications lines from the originating installations to a central communications facility at the Air Force's Standard Systems Center, Gunter Air Force Station, Ala. The communication facility will route personal property information electronically to destination installations as well as to MTMC.

Many of the information flows shown in the long-term EDI freight program, particularly those that relate to the audit and payment processes, also apply to personal property movements. Because those shipments currently use the GBL and are therefore paid centrally at DoD's payment centers (close to 800,000 per year), similar operating concepts should apply. That is, personal property GBL information needs to be pre-positioned at the payment centers, rated before payment, and reconciled against carrier's electronic invoices. In the long term, common standards need to be developed for CONUS freight, personal property, and international shipments, and communication solutions and services should be shared.

OTHER CONSIDERATIONS

The long-term EDI program for CONUS freight movements must ultimately mesh with other transportation strategies. Perhaps the most important of those other strategies relates to the way DoD procures commercial transportation services.

In the private sector, successful EDI applications are predicated on strong and long-term relationships with business partners, be they vendors, customers, or transportation carriers. These types of relationships are needed because establishing an electronic trading relationship is time-consuming and requires extensive coordination.

Commercial shippers assure strong business relationships with their freight carriers by concentrating traffic with a small number of carriers and by purchasing transportation services under contract carriage arrangements. DoD has a similar strategy which is generally referred to as the Guaranteed Freight (GF) program. Under that MTMC-coordinated program, a specified volume of traffic is awarded to a single carrier for a certain period of time, usually 1 year. However, less than one-third of DoD's CONUS freight shipments move under GF arrangements; the vast majority of traffic moves under a process in which carriers voluntarily submit tenders for service. These tenders can be submitted at any time and specify the costs for a particular movement. MTMC procedures call for routing shipments with those

carriers who have submitted the lowest cost tenders. Consequently, business relationships with carriers tend to be short term and susceptible to rapid change. Thus, DoD procures most of its transportation services in a way that is not conducive to an electronic exchange of business information with the commercial carrier industry.

We believe that the GF and EDI programs are closely linked. Specifically, the pace at which the GF program grows may dictate the pace of the EDI program, particularly as it relates to the electronic exchange of information with carriers. Consequently, those shipping activities that have embraced the GF strategy for procuring transportation services are better positioned to implement an EDI program. DLA depots are a prime example. Transportation managers indicate that more than 90 percent of DLA's freight GBL shipments move under GF arrangements. The Military Services, on the other hand, ship less than 10 percent of their movements under GF arrangements.

In summary, DoD's long-term EDI program will be affected by other transportation strategies, notably transportation procurement strategies. MTMC plans to aggressively expand the GF program. That expansion should result in lower transportation costs, improved service, and streamlined operations. The added benefit of stronger business relationships with carrier trading partners is an asset to DoD's EDI program.

RECOMMENDATIONS

We recommend that DoD strive toward developing procedures for conducting all its freight movement business transactions electronically. Furthermore, since similar information flows exist for personal property and international shipments, we also recommend that DoD attempt to conduct those business transactions electronically.

We do, however, recognize that DoD cannot simultaneously pursue implementation of electronic transmissions for all of business information flows shown in the long-term concept. Many of the standards needed for EDI have not yet been developed and, drawing upon private-sector experiences, we further recommend that DoD focus its initial EDI implementation efforts on just a few applications. In Chapter 3, we present a short-term EDI program that addresses this initial focus.

CHAPTER 3

SHORT-TERM EDI PROGRAM FOR DEFENSE TRANSPORTATION

In this chapter, we present a program that DoD can implement in the next 2 to 5 years to move its transportation operations into the electronic age. We examine the conditions under which the private sector has made the transition from paper-intensive to electronic operations and point out the similarities between that environment and DoD's. We present and describe a short-term operating concept and identify six immediate actions that the ASD(P&L) should undertake to implement that concept. We also provide a preliminary estimate of the costs of the proposed short-term program and the dollar benefits that will flow from its implementation.

NEAR-TERM FOCUS

Private-Sector Strategy

Successful EDI programs in the private sector have several similar characteristics: they concentrate on the audit and payment process and to a lesser extent on shipment status, or tracing, within the shipment process; they focus, at least initially, on domestic freight movements; and they are oriented toward carriers who have an expressed interest in exchanging business information electronically.

Private-sector companies selected those areas of concentration for four primary reasons: the audit and freight payment process offered the greatest and quickest return on investment because it is labor-intensive and requires extensive routine processing; their activities are generally concentrated such that a small number of shipping points and carriers accounted for most of the paper generated in the transportation process; several of their freight carrier trading partners already had the capability to send freight invoices electronically; and this approach provided a solid foundation for gaining the experience required to expand into other electronic interchange areas.

DoD Transportation Environment

To assess whether the strategies used by private-sector companies to initiate an EDI transportation program are applicable to DoD, we examined DoD's freight transportation environment. Specifically, we reviewed current payment center operations, the characteristics of DoD shipments, and the commercial carrier industry that serves DoD.

Payment Center Operations

The DoD freight payment process is largely a manual operation, processing and paying thousands of invoices each day. The largest of the three DoD payment centers, USAFAC, pays most of the Army, Air Force, and DLA freight bills. Altogether, USAFAC pays 86 percent of all CONUS freight bills; the Navy payment center, 12 percent; and the Marine Corps payment center, 2 percent.

At USAFAC, close to 350 people pay the 12,000 transportation or transportation-related bills received on a typical work day. Over half of those bills are GBLs, both freight (5,200 per day) and personal property (2,500 per day).

With some exceptions, GSA currently audits most of DoD's transportation vouchers; those audits, however, are conducted after the invoices have been paid. DoD has several initiatives under way to explore the potential of prepayment audits, with USAFAC being the key activity in those initiatives.

Shipment Characteristics

DoD has two major categories of freight bills: CONUS and international. Within CONUS, freight bills are further grouped into (1) freight and personal property GBLs and (2) commercial bills of lading, with the distinguishing characteristic being difference in the payment processes. (Commercial bills are paid locally.) Although the number of international bills issued each year by DoD is large, implementing an EDI program in that environment is extremely difficult because of the need for internationally recognized standards and conventions, which are not as well developed as the domestic standards.

Each year, DoD issues approximately twice as many CONUS freight GBLs as personal property GBLs (1,500,000 versus 700,000). All of those GBLs are paid by one of the three payment centers. In contrast, most commercial bills are paid by the

shipping activity and little collective information is available on the number issued and dollars paid.

Concentration of Traffic

Within DoD, 85 percent of the total CONUS freight GBLs issued each year are for motor carriers; air carriers account for 12 percent, and rail carriers for 2 percent. Although rail shipments account for substantially larger portions of DoD's total weight (10 percent) and cost (18 percent), the key characteristic when considering an EDI application is the number of shipments because each shipment represents a freight bill that could be transmitted electronically. Table 3-1 shows the makeup of DoD's CONUS freight shipments by mode for 1986.

TABLE 3-1

CONUS FREIGHT SHIPMENTS BY MODE

(October 1985 – September 1986)

Mode	Shipments (000)	Percent of total
Motor	1,145	85
Air	162	12
Rail	23	2
Other	15	1
Total	1,345	100

An examination of the CONUS freight shipments shows that DLA is the predominant shipper [including shipments by Defense Contract Administration Service (DCAS)], followed by the Army, the Air Force, and the Navy/Marine Corps. The specific breakdown of CONUS freight shipments by shipping organization is given in Table 3-2.

Taking this analysis one step further, we find that the 20 largest shipping activities, most of which are DLA and Army, account for more than 55 percent of the total CONUS freight shipments and the top 145 account for more than 85 percent. (Appendix B presents a more detailed discussion of freight traffic characteristics.)

TABLE 3-2

CONUS FREIGHT SHIPMENTS
BY SHIPPING ORGANIZATION

(October 1985 - September 1986)

Organization	Shipments (000)	Percent of total
DLA	455	34
DCAS	148	11
Army	327	24
Air Force	229	17
Navy	163	12
Marine Corps	23	2
Total	1,345	100

Carrier Industry

Many carriers of DoD freight, generally the same ones used by the private sector, have the capability to send freight invoices electronically because they have an economic incentive to initiate the payment cycle sooner. Twenty-three carriers account for approximately half of all CONUS freight shipments. Fourteen of those carriers (60 percent) have already invested in EDI capability, while the remaining ones indicate that they will develop the capability as the market requires. The significance of this situation is far-reaching: If DoD can establish EDI arrangements with its high-volume carriers, it will be able to accelerate implementation of its EDI program. (Appendix C provides more information on carrier-industry capabilities and interests.)

Conclusions and Recommendations

Our analysis of DoD's transportation environment shows that the same characteristics that led private-sector shippers to concentrate their EDI efforts on freight payment applications also exist in Defense transportation: payment center operations that are paper- and people-intensive, concentration of activity at a

limited number of shipping points and with a limited number of carriers, and carrier trading partners that have the capability to submit invoices electronically.

To ensure successful transition from a paper-based operation to one that makes extensive use of electronic transmissions, we recommend that DoD's EDI program initially focus on paying and auditing CONUS freight bills at USAFAC. Since DoD freight traffic is so concentrated, we also recommend that DoD stress implementation of EDI capability at 114 of the largest shipping activities supported by USAFAC. Similar efforts should be undertaken at the other payment centers shortly thereafter, bringing the total number of EDI-capable shipping activities to 145.

This narrow short-term focus will pave the way for a comprehensive and effective EDI program in Defense transportation. It stresses those areas that promise the greatest payback, offer the most potential for success, and provide the best foundation for much broader applications.

SHORT-TERM OPERATING CONCEPT

It is clear that the key organizations in DoD's short-term (2 to 5 year) EDI program are the payment centers. But other activities or organizations must also participate in the short-term EDI program. These include DoD shippers, MTMC, GSA, and commercial carriers and banks. The role of each is described below.

DoD Shippers

The short-term operating concept (Figure 3-1) shows DoD shippers electronically exchanging shipment information, through a public VAN, with various business partners including payment centers, carriers, MTMC, and consignees. The public VAN provides document handling and distribution, protocol conversions, and other services. The use of public VANs is discussed in more detail later in this chapter.

Because the vast majority of DoD freight shipments are moved by motor carriers, we show the TDCC Transaction Set No. 204, *Shipment Information – Motor*, as the standard for exchanging this information. Similar standards exist for the rail and air modes and these will also be used. Furthermore, efforts are under way to combine these three mode-specific standards into one generic American

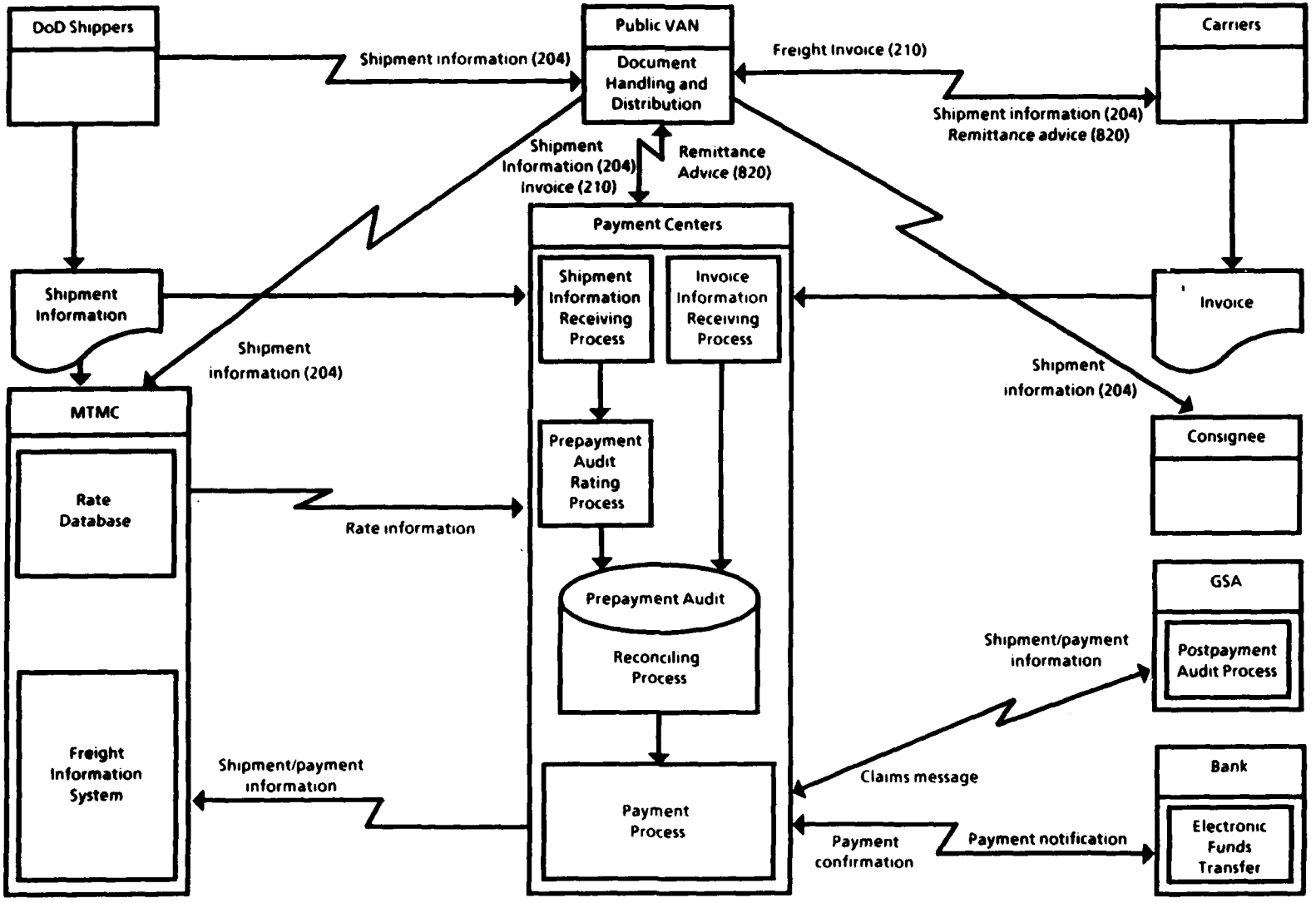


FIG. 3-1. SHORT-TERM OPERATING CONCEPT

National Standards Institute (ANSI) standard. Should this prove feasible, the ANSI standard should then be used to communicate shipment information.

The short-term operating concept calls for installing EDI capability at approximately 145 DoD shipping points. This will enable over 85 percent of all DoD freight GBLs to be electronically exchanged. Since numerous, smaller shipping activities will not be able to economically justify installing EDI capability, our operating concept also shows some shipment information being exchanged using a paper document.

With or without EDI capability, commercial carriers will still require a paper document when they pick up a shipment. That document can be provided either by the shipper in the form of a GBL or other paper document, or by the carrier if DoD shippers are able to send accurate and timely electronic shipment information to the carriers before shipment pickup. In the latter case, DoD shippers will not have to generate a GBL for a carrier. However, we do not believe this will be feasible in the short term because very few carriers have oriented their systems to operate in this manner. Nevertheless, the short-term operating concept should provide for this capability in anticipation of future requirements.

Payment Centers

As noted previously, the payment centers are key to DoD's short-term EDI program. Our short-term operating concept shows shipment information and invoice information flowing both electronically and on paper to the payment centers. It also shows, in general terms, how this information is processed and how payment information is then exchanged electronically with MTMC, GSA, and commercial banks.

DoD shippers without electronic capability will mail GBL copies to the payment centers where key elements of information will be captured. The payment centers will use this pre-positioned shipment information to access MTMC's rate database for the purpose of rating shipments before payment. Then, as carriers submit electronic or paper invoices, they can be automatically matched and reconciled against the pre-positioned and rated shipment information. We estimate that even in the short term, about 50 percent of all freight invoices will be submitted electronically, through a public VAN, to the payment centers. The remaining invoices will be submitted using existing or newly developed procedures.

Regardless, information from these paper transactions will be captured and also reconciled against shipment information.

Private-sector experiences indicate that successful reconciliation occurs at a rate of 95 percent or better. For those invoices that cannot be reconciled, payment center personnel either work with carriers to resolve the discrepancies, pay the invoiced amount and recover overcharges in the postpayment audit cycle, or pay the amount calculated through prepayment rating.

The short-term operating concept also calls for payment information to be exchanged with MTMC, GSA, and commercial banks.

Military Traffic Management Command

MTMC needs both shipment information and freight payment information to carry out its management review responsibilities and to create the Freight Information System (FINS) database. The short-term operating concept shows shipment information flowing to MTMC (specifically its area commands) from DoD shipping activities (through a public VAN). That information is then fed into MTMC's management review process. The operating concept also shows shipment information combined with payment information flowing from payment centers to the FINS database. This dual flow of shipment information to MTMC, first from shippers and then from payment centers, may not be required if the payment centers can provide timely shipment information for the management review process. Additionally, information exchange requirements between MTMC, payment centers, and DoD shippers may change depending on MTMC's finalized operating concepts for its CFM system.

General Services Administration

The short-term operating concept also calls for GSA to receive shipment and payment information from the payment centers. This will enable GSA to perform a postpayment audit. In turn, GSA will send a collection message transaction to the payment centers, which indicates that an overpayment has been made to a carrier and authorizes the payment centers to take appropriate action to recover the overpayment.

GSA, however, currently has little automation to support its postpayment audit process. Furthermore, most of the audits are actually being performed by

contractors. If GSA expects to be a full partner in the automatic processing of freight information, it will need to build an automated system that permits the receipt and processing of electronic shipment and payment information. GSA's contractors will also need this capability.

Commercial Banks

EFT is a natural extension of DoD's EDI program for Defense transportation. As shown in the short-term operating concept, it involves the electronic exchange of payment information between payment centers and commercial banks. The banks then automatically credit a carrier's account.

Several different standards are currently being used to accomplish EFT and it may be several years before industry, Government, and the banks agree to common business conventions and standards. Nonetheless, we believe Defense transportation's EDI program should explore the feasibility of EFT at the payment centers.

Communications

At the heart of any EDI program is the need for efficient and effective electronic communications. The short-term operating concept (Figure 3-1) shows the need for two different types of communication: point to point and VANs.

Point to Point

Point-to-point communications involves a direct linkage between the computer of two or more trading partners. It is most often used when the volume of data to be exchanged is large and when standards, conventions, and protocols are mutually acceptable.

Our short-term operating concept shows four point-to-point communication links. The first is between the payment centers and MTMC's rate database. This permits the payment centers to access MTMC's database to perform prepayment shipment rating. The second is between the payment centers and MTMC's FINS. This permits the payment centers to transfer large amounts of shipment and payment data to the FINS database. The third is between the payment centers and GSA where shipment and payment information are used for postpayment auditing. The fourth point-to-point communication link is between the payment centers and

the banks to accomplish EFT. (Alternatively, depending on the number of banks participating, EFT communications could also be accomplished using VAN services.)

Value-Added Networks

As shown in the operating concept, VANs are used for all other electronic exchanges of information. A VAN provides what is commonly referred to as "mailbox" services. Those services permit users to send EDI transactions to multiple receivers in a single communications session. In turn, receivers are able to access their mailbox for EDI transactions in a single communications session. The principal advantage of accessing the mailbox in one session is that it eliminates the need for a dedicated computer to await incoming calls.

VANs also enable dissimilar computers to communicate with each other. For instance, some of the larger public VANs can accommodate over 100 different communication protocols. They also often provide for long-haul telecommunications. Alternatively, users can provide for their own telecommunications and simply use VANs for their mailbox services.

Although DoD has its own telecommunications network, DDN, it does not provide for value-added services such as mailboxes and protocol conversion. As such, our operating concept calls for using DDN for point-to-point communications as well as interfacing with public VANs. We believe that using a public VAN, instead of developing a proprietary VAN, will help to minimize the risks associated with Defense transportation's EDI program.

Summary

The short-term operating concept focuses on DoD's freight payment operations. It includes the long-term information flows that are specifically related to the audit and payment function. The key requirements of the short-term operating concept are also requirements for the long-term operating concept: paper and electronic receiving capability; good financial controls; the ability to conduct automated audits before payment, including rating and reconciling; the ability to continue conducting audits after payment; the supporting of shipment history information; and the ability to use EFT technology to pay invoices.

IMPLEMENTATION ACTIONS

In Chapter 2, we outline a long-term conceptual design for DoD's EDI program. In this chapter, we identify several areas that need immediate attention and present a short-term operating concept. We now focus on the implementation actions needed to bring about the recommended short-term changes. (Detailed implementation activities are presented in Appendix D.)

Establish a Program Office

Implementation of a comprehensive EDI program within DoD requires extensive centralized coordination. Private-sector firms have found that an EDI Program Office, or focal point, is critical to a successful transition from paper- to electronic-based operations. We believe that DoD also needs to establish such an office. Its responsibilities would include coordinating implementation efforts; advising on the development of new transportation business methods, policies, and regulations that stem from EDI applications; providing guidance on data content and standards conventions; representing DoD's interests on standards committees; advising on hardware and software procurements; and contracting for communications and network services. It would also be responsible for qualifying translation software vendor packages, which the Military Services and DLA would then purchase, or for purchasing those packages for use by the Military Services and DLA.

A program office with those types of responsibilities would require a staff of approximately 8 to 10 people. That staff would include a program manager to oversee the entire effort; project managers to direct several EDI initiatives; an EDI and transportation business coordinator, who would concentrate on standards, software requirements, and business methods; a technical coordinator, who would focus on the telecommunications, network services, and hardware issues; a trading-partner coordinator, who, working closely with MTMC, would specialize in freight-carrier involvement; and various administrative support. Table 3-3 describes some of the responsibilities of those staff members.

Since the program office's primary responsibility is coordination, it should be established within the first year to coordinate implementation.

TABLE 3-3

RESPONSIBILITIES OF A PROGRAM OFFICE STAFF

Responsibilities	Roles			
	Program manager	Technical coordinator	Business coordinator	Trading-partner coordinator
Procedural and Administrative				
• Initiate EDI policy and procedure changes	X		X	
• Represent DoD interests on standards committees		X	X	
• Establish liaison with the Military Services and other appropriate agencies, e.g., DLA, MTMC, to accomplish tasked responsibilities	X			
• Determine and submit funding requirements	X			
• Establish milestones and provide status reports	X			
Technical				
• Contract for third-party network services		X	X	
• Contract for telecommunications requirements services and/or determine/ coordinate DDN telecommunications support		X		
• Contract for EDI translation software and maintenance support		X	X	
• Advise on hardware requirements at user installations		X		
• Advise on application software requirements at user installations			X	
• Define user data and standards conventions requirements			X	
• Advise on interface software requirements at user installations		X	X	
Coordination				
• Coordinate standards maintenance and user programming changes at user installations			X	
• Coordinate with other major DoD initiatives	X			
• Coordinate with carrier industry				X
Educational				
• Train and provide guidance to users		X	X	
• Develop/publish implementation guides		X	X	

Upgrade USAFAC's Operations

As noted previously, USAFAC is the pacing activity for DoD's entry into an electronic-based transportation environment. Since USAFAC's operations are currently oriented toward the processing of paper, they need to be substantially upgraded. We believe that USAFAC should be capable of receiving shipment information and freight invoices electronically and then automatically matching shipment information with invoices, reconciling out-of-tolerance invoices, taking advantage of carrier discounts, protecting against duplicate billings, paying acceptable invoices, generating shipment information, and maintaining acceptable audit trails.

Until these enhancements to USAFAC's operations are in place, DoD's efforts to launch an extensive EDI program will not be successful – most of the early benefits of the program will accrue in the payment function. But DoD's other payment centers also need to be involved. Specifically, they need to participate in USAFAC's upgrading efforts and agree to common system requirements, operating methods, and procedures. We believe this will enable much of the USAFAC systems upgrade to be transferred to the other payment centers. Alternatively, it could even facilitate a consolidation of payment center operations in the long term.

Coordinate Development of Automated Systems at MTMC and GSA

The short-term operating concept calls for MTMC and GSA to receive shipment and payment information electronically. However, like USAFAC and the shipping activities, MTMC and GSA are currently geared to processing paper. We believe that little will be gained from the use of EDI if information is transmitted electronically, then printed, and the cumbersome manual processing of paper continued. Ideally, automated systems should be built that permit the receipt and processing of electronic information.

MTMC's CFM program encompasses such systems. It is our understanding that MTMC will concentrate initially on developing a rate database that will permit prepayment rating (a critical component of the short-term program). But we believe that MTMC should also explore, in the short term, building the automated systems that will permit receiving and processing of electronic information to improve other business operations. These would likely include automating the GBL management

review process and enhancing FINS to enable the electronic receipt of shipment and payment information.

GSA also recognizes the need to build an automated system to process shipment and payment information. It now is in the process of identifying specific information requirements for postpayment auditing and exploring concepts for its automation. However, GSA's operations are complicated somewhat because much of the auditing is now performed by subcontractors.

At a minimum, GSA needs to build an automated system that will receive electronic information, translate coded information into free form, and print a facsimile of a GBL. This will permit GSA, and its subcontractors, to continue postpayment auditing until a more sophisticated system can be designed and built.

Add EDI Capability at Shipping Activities

Concurrent with the upgrade of USAFAC's, MTMC's, and GSA's operations, we believe that DoD needs to make 145 shipping activities, representing over 85 percent of DoD's freight shipments, EDI capable. This should be accomplished in phases, with the initial focus on 61 of the 114 largest shipping activities, which represent approximately 80 percent of the CONUS freight shipments that are paid by USAFAC.

To implement EDI at these largest shipping activities, the EDI Program Office, DLA, and the Military Services will need to coordinate extensively on such issues as standards, hardware, translation software, interface software, application software, and trading partners.

Identify and Tailor Standards

Although the near-term EDI program calls for using existing commercial standards to electronically transmit and receive shipment information, the specific data requirements of users need to be identified. Otherwise, sending the entire set of GBL information will result in extremely large record sizes and, in turn, increased telecommunication requirements and costs. We believe that one of the first steps in installing EDI capability at the shipping activities is to identify the users' information requirements and then to customize electronic transmissions to meet those needs. We also believe that the use of free-form information should be discouraged because it significantly increases record sizes and computers cannot process

free-form information. Instead, additional standard codes should be developed to replace free-form information.

Select a Hardware Approach

Hardware requirements in support of DoD's EDI program are dependent on shipment volumes, expected future transaction capacity requirements, existing equipment, equipment mandates, and a host of other factors. However, we expect shipping activities to take one of three different hardware approaches: mainframe, front-end, or stand-alone.

The mainframe approach will likely be used at the 16 largest shipping activities. Those activities will need to purchase commercially available EDI translation software for installation on existing or upgraded mainframe hardware.

The front-end approach will probably be used at large- or mid-sized shipping activities. Under this approach, an existing host computer is front-ended or interfaced with a microcomputer or minicomputer. Information is downloaded from the host computer to the front-end computer where the software resides that permits translation to the EDI standards. This approach is popular in the private sector because security is thought to be enhanced by limiting outside access to the host computer.

The stand-alone approach will likely be used at the smallest shipping activities, which typically have little or no existing automation. Consequently, those activities will likely use microcomputers to enter, translate, and electronically communicate shipment information. Numerous vendors provide software packages for this stand-alone microcomputer environment.

Regardless of the approach used by the shipping activity, it is clear that the requirement for hardware is a complicated issue. Each activity will need to analyze its own requirements and coordinate closely with the EDI Program Office on the selection of hardware solutions.

Provide Software

Depending on the hardware environment, shipping activities in the EDI program will need to purchase, lease, or develop translation, interface, and/or application software.

Translation software reformats the shipping activity's unique GBL data sets into the standardized formats for transmission to MTMC, consignees, and finance centers. It also permits the receipt of shipment information and translates standardized formats into user-unique formats for controlling shipments that are due in. In addition, it performs other functions including automatic dialing, reporting, and archiving.

Translation software will need to be purchased or leased from software vendors. Currently, it is available commercially for mainframes and microcomputers at competitive prices. We believe the EDI Program Office should take the lead in qualifying vendors and buying software and software maintenance under a quantity discount plan for multiple installations. Many of the existing ANSI and transportation transaction set standards can be purchased in a single software package for a nominal incremental amount in preparation for future expansion. The purchase of software maintenance support is particularly important because (1) the existing commercial standards will continue to change and (2) ANSI eventually will develop generic transportation standards that will need to be incorporated into the software package.

Interface software will be required for a front-end hardware environment. It permits shipment information to be downloaded or uploaded between the host computer and the front-end computer. The Military Services or the local activities are responsible for developing this software. As with translation software, interface software will need to be maintained to accommodate changes in the standards.

Various types of application software will need to be developed at the shipping activities to realize the full benefits of EDI. Again, specifics vary from activity to activity depending on the hardware environment and other considerations. Most of the smaller DoD shipping activities, for example, have no automated GBL preparation capability; instead, GBLs are created manually on a typewriter. At those sites, initially typing the GBL and then entering GBL information into a stand-alone microcomputer for electronic transmission would result in tremendous duplication of effort. The best approach is to combine automated GBL preparation application software with the EDI translation software; such application software does exist within DoD today for microcomputers.

As another example, application software will also need to be developed at those shipping activities that have automated GBL preparation capability. In the DoD EDI demonstration test, we found that these installations often make last-minute, handwritten adjustments to the paper GBL that is given to the driver. Because the shipment information data sets are constructed when the paper copy of the GBL is initially printed, handwritten adjustments result in a shipment information data set that no longer matches the original printed GBL. To solve this problem, application software needs to be developed that can accommodate personnel adjusting the data sets to reflect last-minute changes to the GBL. Only then can operations be assured that accurate shipment information is being sent electronically.

In summary, making 145 shipping points EDI capable will provide a solid foundation for the long-term transportation EDI program. At a minimum, the shipping points need the capability to send GBL shipment information using existing commercial standards and software. Many EDI software packages, however, have the capability to transact all of the existing transportation standards electronically. Those packages should be looked at closely because they would facilitate the future expansion of the EDI program, including the adoption of ANSI standards. Ultimately, the EDI Program Office, Military Services, DLA, MTMC, and payment centers must all coordinate closely to assure that the EDI capability installed at shipping points meets the overall program objectives.

Configure a Communications Network

DoD needs to configure a communications network linking the 145 highest volume shipping activities to consignees who use EDI to receive shipments and freight carriers who use EDI to request shipment planning information; it must also link the shipping activities, carriers, MTMC, GSA, and banks to USAFAC. The two key components of the communications network, the communications design and the network services, must be integrated to satisfy the total network communications requirements.

Select a Communications Design

The network communications design needs to accommodate the requirements of many different users. It is affected by the EDI operating concept, specialized communications requirements, and communications mandates.

As shown in Figure 3-1, the short-term EDI operating concept includes communications between and among hundreds of users including DoD shipping points, payment centers, MTMC, consignees, carriers, GSA, and banks.

The specialized communications requirements include numerous technical choices on issues involving data transmission standards, protocols, communication line types, line speeds, communication hardware and software, and security.

Insofar as communications mandates are concerned, the Military Services and DLA are at different stages of compliance to Defense Communications Agency (DCA) mandate on use of DDN. While DCA is the principal supplier of telecommunications to DoD activities, it does not provide such network services as document handling and distribution, and communications compatibility specifically required by the EDI operating concept. Furthermore, DCA takes up to 18 months to supply DDN service.

Because of the complexity of the communications design issues, they need to be coordinated among a variety of activities including a Joint Service/Agency Users' Group, USAFAC, and the EDI Program Office.

The Joint Service/Agency Users' Group, along with USAFAC and the Program Office, should be responsible for developing a consensus on the EDI operating concept, defining the communications requirements, analyzing DDN capabilities to meet those requirements, forming alternative strategies for requirements not provided by the DDN, and implementing the communications network. (Detailed implementation work plans including schedule and responsibilities are presented in Appendix D.)

Select An Approach to Network Services

Network, or value-added, services include EDI document handling and distribution, communication compatibility, administration, customer service, and

security. Those services are required to support a centralized distribution network and are not needed for direct transmissions.

DoD can either build its own network services or it can lease them. That decision is complicated by the large number of network services suppliers and the wide range in the services they provide and the costs of those services. We believe that the cost difference between building and leasing is insignificant. Based upon our experience with leased network services in the recently completed DoD EDI demonstration test, we believe that the use of leased services will speed and enhance the startup of DoD's EDI program.

The cost difference between building and leasing will swing in favor of supporting a DoD-owned VAN in the long term if the cost is shared by other programs such as MTMC's CFM and the MODELS program. (Appendix E presents a definition of network services, an examination of their benefits, the detailed purchase-versus-lease economics, and an evaluation of network service suppliers.)

As with the communication design, network services should be implemented through a coordinated effort of the Joint Services/Agency Users' Group, USAFAC, and the EDI Program Office. Those activities should be responsible for defining the network services, hardware, and communications interface requirements, including the potential requirement to link the DDN to a commercial network services supplier. They also will need to evaluate the capability of commercial network vendors to satisfy DoD's requirements and then make the purchase-versus-lease decision. Finally, they will need to integrate the communication and network services and test them in parallel with current operations before final implementation.

Resolve Operating Regulation, Policy, and Procedure Issues

Many of the EDI concepts and techniques are so new to DoD that legal and regulatory issues surrounding their use have not been fully resolved. Ultimately, several organizations need to act in concert to review and modify regulations so that DoD information, particularly GBL and freight invoice information, can be exchanged electronically. These organizations include as a minimum the EDI Program Office, General Accounting Office (GAO), GSA, and MTMC.

GAO is responsible for administering the regulations that prescribe Federal transportation procedures, including the use, generation, and auditing of GBLs. In turn, GAO has delegated the auditing and much of the regulation responsibility for the GBL to GSA. (The appropriate regulations and procedures are found in Chapter 101, Code of Federal Regulations, Title 41, *Public Contracting and Property Management.*) Finally, MTMC maintains the Defense Traffic Management Regulation, which governs the preparation and use of GBLs within DoD.

We believe that the EDI Program Office, with the support of the Joint Services/Agency Users' Group, should take the lead in identifying the policies, regulations, and procedures that need to be modified, drafting the suggested changes, and initiating the change process. (Appendix F presents a more thorough discussion of the needed changes.)

Schedule

A proposed implementation schedule for each of the above actions is given in Figure 3-2. That figure shows that a major part of the effort should be completed within the next 2 to 3 years. (Detailed work plans including tasks, schedules, and responsibilities are presented in Appendix D.)

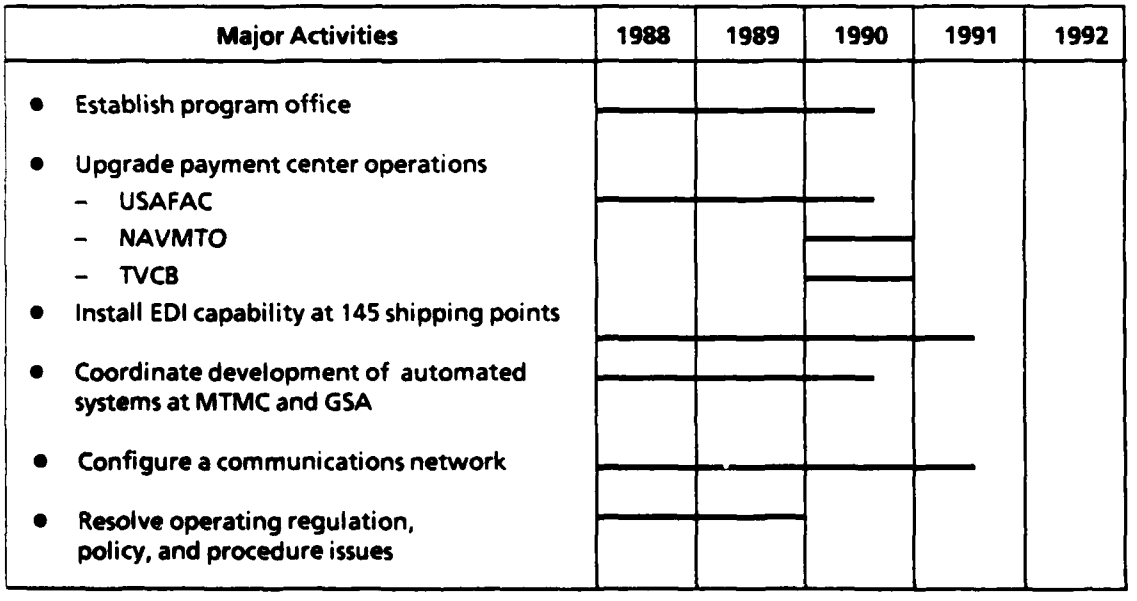


FIG. 3-2. SHORT-TERM IMPLEMENTATION SCHEDULE

Recommendation

To launch its EDI program, we recommend that the ASD(P&L) undertake several interrelated actions that include: establishing an EDI Program Office, enhancing USAFAC's operations, installing EDI capability at the 145 largest shipping activities, coordinating systems development at MTMC and GSA, configuring a telecommunications network to support the EDI program, and resolving the policy and procedural problems involved in conducting business electronically. These actions will launch DoD's EDI program in the right direction and will establish the necessary foundation for a much broader program in the future.

PROJECTED COSTS AND BENEFITS

The EDI initiatives described above will most likely not be completed before the end of 1991, with the upgrading of USAFAC operations being the pacing initiative. Once DoD is in position to conduct its transportation business electronically, the program should generate (as shown in Table 3-4) a positive net savings in the first year, repay initial investments within 3 years, and generate more than $1.8 million return on investment every year thereafter for the life of the program. These estimates do not include any potential savings that could be generated by MTMC, GSA, consignees, and payment centers other than USAFAC. (For a more detailed discussion of the anticipated costs and benefits of DoD's EDI program, see Appendix G.)

We estimate that DoD savings at USAFAC will be both direct and indirect. Direct savings should accrue primarily from manpower reductions within the transportation payment area at USAFAC. We estimate that USAFAC will be able to reduce its staffing by 114 people through improvements in data input and office automation. (This estimate is based on the experience of large private-sector companies with similar volumes.)

Most of the indirect savings will come from rating and reconciling freight bills before payment. This operation alone should give DoD the use of the $40 million to $50 million it overpays carriers and currently is found by GSA in its postpayment audits. The savings are based upon those funds being available to the Government

TABLE 3-4

DoD's SHORT-TERM EDI PROGRAM: INVESTMENT ANALYSIS

($000)

	1988	1989	1990	1991	1992	1993
Annualized savings						
Direct savings			972	1,087	1,301	1,530
Indirect savings			475	637	792	950
Total savings			1,447	1,724	2,093	2,480
Annualized recurring operating costs						
Network services			284	311	320	305
Telecommunications			296	588	599	611
Total operating costs			580	899	919	916
Net annualized savings			867	825	1,174	1,564
Annualized investment	(300)	(1,390)	(864)			
Cumulative return on investment	*(300)*	*(1,690)*	*(1,687)*	*(862)*	312	1,876

8 months earlier. In addition, although difficult to quantify, other indirect savings should be generated from taking better advantage of discount opportunities.

CHAPTER 4

THE NEXT STEPS

In Chapter 2, we outline a long-term plan for DoD's EDI program, propose operating concepts for the program, identify several implementation actions, and assess the economic implications of launching and sustaining an EDI program within DoD.

The private sector played a key role in much of what we propose for DoD. The rationale is straightforward -- numerous private companies already have successfully resolved many of the same EDI issues that DoD now faces. As a result, they are conducting much of their transportation business electronically. They benefit from the improved productivity, reduced staffing, and strengthened financial controls. DoD can realize these same payoffs by conducting its transportation activities electronically.

To obtain those payoffs, however, DoD needs to undertake six major initiatives simultaneously:

- Establish an EDI Program Office to coordinate entry into an electronic environment. Private companies have found such an office vital to improving transportation operations.
- Upgrade the electronic processing capabilities at DoD payment centers. Most early gains will be made there.
- Install EDI capability at 145 of the largest shipping activities. They account for more than 85 percent of all cargo movements and are essential to a successful EDI program in Defense transportation.
- Coordinate the development of automated systems within the Military Services, DLA, MTMC, and GSA. This will permit the receipt and processing of electronic information.
- Configure a telecommunications network linking shippers, consignees, commercial carriers, payment centers, and other transportation activities. Include, as part of the network, commercial telecommunication services.

- Modify Federal regulations and DoD directives and instructions that inhibit DoD from conducting its transportation business, both domestic and international, electronically. Replace, update, or eliminate paper-oriented practices.

These initiatives, reinforced by clear, supportive guidance from ASD(P&L), can launch a successful, long-term EDI program for Defense transportation.

APPENDIX A

LONG-RANGE EDI BUSINESS INFORMATION FLOWS

This appendix defines each of the business information flows identified in Chapter 2. Table A-1 describes the information flows within the routing and shipment processes; Table A-2 describes the information flows within the audit and payment processes; Table A-3 describes the information flows within the transportation management process; and Table A-4 describes the information flows within the claims process.

There are four types of information flow transmission processes: interactive systems, Electronic Data Interchange (EDI), paper, and electronic mail. Interactive systems are transmissions requiring a direct link from a computer application to a remote database. This can be either immediate response as in the case of online inquiry or batch. EDI standards are not required for interactive applications. The information flows that are good candidates for interactive applications include the route/rate request, tariff/rate information, and route instruction notes. Online interactive applications could be used by shippers or procurement agencies for immediate inquiry of rates and carrier selection. It could also be used by the payment centers to access the rate database located at the Military Traffic Management Command (MTMC) for use in the prepayment audit process.

EDI is used to transmit information to multiple business partners in a standard format. The Transportation Data Coordinating Committee (TDCC) has developed mode-specific transportation standards. These are shown in the following tables. The American National Standards Institute (ANSI) is in the process of exploring and drafting generic standards. EDI programs generally utilize a communications network providing batch storage and forward services. All information flows described in Tables A-1 through A-4 are candidates for EDI with the exception of the interactive/online candidates described above and ad hoc transportation reports.

Ad hoc transportation reports, as in the case of nonroutine information requests, can be transmitted either by paper or electronic mail. Electronic mail is simply the transfer of an information file, utilizing no specific data standards, from one computer to another.

TABLE A-1

ROUTING AND SHIPMENT PROCESSES

Process	Information flow	External standard	Sender	Receiver	Purpose	Comments
Routing	Tender Submission	Rail – TDCC 460 Series Other modes – None	Carrier	MTMC	To supply rate information for satisfying transportation services bidding procedures.	Data content and format are in the process of being standardized by MTMC.
	Tender Acceptance/ Rejection	None	MTMC	Carrier	To notify a carrier of acceptance or rejection of a tender submission.	
	Standing Route Order	None	MTMC	Shipper	To supply standard routing information.	
	Route/Rate Request	Rail – TDCC 460 Series Other modes – None	Shipper	MTMC	To request routing or rating information.	This information flow is a good candidate for online EDI.
	Tariff/Rate Information	Rail – TDCC 460 Series Other modes – None	MTMC	Shipper	To supply tariff or rate information to shippers for preparation of estimated charges.	This information flow is a good candidate for online EDI.
	Route Instruction Notes	None	MTMC	Shipper	To supply special requested route information.	This information flow is a good candidate for online EDI.
Network Routing	Shipment Information	TDCC 104, 204, 304, 404	Shipper	MTMC	To supply shipment candidates for consolidation and backhaul.	This information flow, not used by DoD, is practiced within the private sector.
	Scheduled Route Instructions	None	MTMC	Shipper	To supply route instructions for consolidated or backhaul moves.	This information flow, not used by DoD, is practiced within the private sector.

TABLE A-1

ROUTING AND SHIPMENT PROCESSES (CONTINUED)

Process	Information flow	External standard	Sender	Receiver	Purpose	Comments
Network Routing	Shipment Pickup Order	TDCC 206[a]	MTMC	Carrier	To request multiple shipment moves from a carrier.	This information flow, not used by DoD, is practiced within the private sector.
	Shipment Acceptance	None	Carrier	MTMC	To acknowledge acceptance or rejection of multiple pickup/delivery requests.	This information flow, not used by DoD, is practiced within the private sector.
Shipment	Shipment Inquiry	TDCC 213	MTMC/ Shipper/ Consignee	Carrier	To inquire as to the status of a shipment.	Three separate business information flow possibilities could be coordinated by MTMC.
	Shipment Status	TDCC 214	Carrier	MTMC/ Shipper/ Consignee	To supply the status of any shipment in response to an inquiry.	Three separate business information flow possibilities could be coordinated by MTMC.
	Shipment Information	TDCC 104, 204, 304, 404	Shipper	MTMC	To supply shipment information for MTMC's traffic management processes.	
	Shipment Pickup Order	TDCC 206[a]	Shipper	Carrier	To request shipment moves from a carrier.	
	Shipment Acceptance	None	Carrier	Shipper	To acknowledge acceptance or rejection of shipment request.	

[a]In process of replacement by TDCC 204 subset

TABLE A-1

ROUTING AND SHIPMENT PROCESSES (CONTINUED)

Process	Information flow	External standard	Sender	Receiver	Purpose	Comments
Shipment	Shipment Information	TDCC 104, 204, 304, 404	Shipper	Carrier	To supply shipment information to carriers for billing and planning purposes.	This is a new information flow created to accommodate EDI business.
	Shipment Information	TDCC 104, 204, 304, 404	Shipper	Consignee	To transmit shipment information to consignee for use in overage, shortage, and damage reconciliation and receipt planning.	The timeliness of EDI makes this information flow useful.

TABLE A-2

AUDIT AND PAYMENT PROCESSES

Process	Information flow	External standard	Sender	Receiver	Purpose	Comments
Prepayment Audit	Shipment Information	TDCC 104, 204, 304, 404	Shipper	Payment Center	To transmit shipment information to payment center for prepayment audit and payment.	This is a new information flow created to accommodate EDI business.
	Tariff/Rate Request	Rail – TDCC 460 Series Other modes – None	Payment Center	MTMC	To request rate information for prepayment audit.	This information flow would be a good candidate for online EDI.
	Tariff/Rate Information	Rail – TDCC 460 Series Other modes – None	MTMC	Payment Center	To supply tariff or rate information for prepayment audit.	This information flow would be a good candidate for online EDI.
	Freight Invoice	TDCC 210	Carrier	Payment Center	To notify payment center of payment due.	
Payment	Remittance Advice	ANSI X12[a] 820	Payment Center	Carrier	To advise carrier of payment.	
	Receipt Notification	None	Consignee	Payment Center	To notify payment center of actual receipt for proof of delivery and for carrier performance data.	This information flow could be transmitted through MTMC.
	Payment Notification	ANSI X12 820 Series	Payment Center	Bank	To authorize payment.	
	Payment Confirmation	ANSI X12 820 Series	Bank	Payment Center	To notify that the payment has been received.	

[a]ANSI X12 is a standard developed by the Accredited Standards Committee (ASC X12) and approved by ANSI

TABLE A-2

AUDIT AND PAYMENT PROCESSES (CONTINUED)

Process	Information flow	External standard	Sender	Receiver	Purpose	Comments
Postpayment Audit	Payment Information	None	Payment Center	GSA[b]	To transfer shipment, invoice, and payment information for post-payment auditing.	
	Claims Message	None	GSA	Payment Center	To notify the payment center that an overcharge claim has been resolved.	

[b]GSA = General Services Administration.

TABLE A-3

TRANSPORTATION MANAGEMENT PROCESS

Process	*Information flow*	*External standard*	Sender	Receiver	*Purpose*	Comments
Transportation Management	Shipment/ Payment Information	TDCC 104, 204, 304, 404	Payment Center	MTMC	To supply MTMC with freight information system data.	If this is timely, MTMC may not need a 204 from the shipper.
	Transportation Reports	None	MTMC	Service	To accommodate miscellaneous routine and ad hoc reporting.	Routine report information may be able to be standardized – ad hoc will not.

TABLE A-4

CLAIMS PROCESS

Process	Information flow	External standard	Sender	Receiver	Purpose	Comments
Claims	Loss or Damage Notification	TDCC 920	Consignee	Payment Center	To notify payment center of freight discrepancy or damage so that claims can be initiated.	
	Loss or Damage Claim	TDCC 920	Payment Center	Carrier	To inform carriers of loss, damage, or overcharge claims.	
	Claim Resolution	TDCC 922	Carrier	Payment Center	To inform claimant of the carrier's resolution of a loss or damage claim.	
	Claim Tracer	TDCC 925	Payment Center	Carrier	To inquire on the status of a claim.	
	Claim Tracer Reply	TDCC 926	Carrier	Payment Center	To reply to a query about claim status.	
	Claim Status Report	TDCC 927	Carrier	Payment Center	To report the status of a claim.	

APPENDIX B

CONUS FREIGHT TRAFFIC ANALYSIS

This appendix tabulates the 145 largest shipping activities within DoD as determined by the number of shipments. Several tabulations are presented:

- Table B-1, "Shipping Activity Report"
- Table B-2, "U.S. Army Finance and Accounting Center Shipping Activity Report"
- Table B-3, "Defense Logistics Agency Shipping Activity Report"
- Table B-4, "Defense Contract Administration Service Shipping Activity Report"
- Table B-5, "Army Shipping Activity Report"
- Table B-6, "Air Force Shipping Activity Report"
- Table B-7, "Navy Shipping Activity Report"
- Table B-8, "Marine Corps Shipping Activity Report."

TABLE B-1

SHIPPING ACTIVITY REPORT

(September 1985 - February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
1	Defense Depot - Memphis, TN	53,065	0.0802	0.08
2	Defense Depot - Mechanicsburg, PA	47,694	0.0721	0.15
3	Defense Depot - Ogden, UT	32,250	0.0488	0.20
4	Defense General Supply Center - Richmond, VA	31,954	0.0483	0.25
5	Defense Depot - Tracy, CA	29,996	0.0454	0.29
6	Defense Personnel Support Center - Philadelphia, PA	26,503	0.0401	0.33
7	Red River Army Depot - Texarkana, TX	25,824	0.0391	0.37
8	New Cumberland Army Depot - New Cumberland, PA	21,830	0.0330	0.41
9	Defense Construction Supply Center - Columbus, OH	19,228	0.0291	0.44
10	Kelly Air Force Base - San Antonio, TX	13,777	0.0208	0.46
11	Letterkenny Army Depot - Chambersburg, PA	12,362	0.0187	0.48
12	Naval Supply Center - Norfolk, VA	8,948	0.0135	0.49
13	Defense Supply Region - Alameda, CA	7,057	0.0107	0.50
14	Naval Supply Center - Oakland, CA	6,901	0.0104	0.51
15	Sharpe Army Depot - Lathrop, CA	6,719	0.0102	0.52
16	Robins Air Force Base - Warner-Robins, GA	6,685	0.0101	0.53
17	Dover Air Force Base - Dover, DE	6,234	0.0094	0.54
18	Tobyhanna Army Depot - Tobyhanna, PA	6,108	0.0092	0.55
19	Anniston Army Depot - Anniston, AL	5,930	0.0090	0.56
20	Tooele Army Depot - Tooele, UT	5,855	0.0089	0.57
21	Lexington Blue Grass Army Depot - Lexington, KY	5,696	0.0086	0.58
22	Rockwell International Corporation - Los Angeles, CA	5,503	0.0083	0.58
23	DCASMA[a] - Dallas, TX	4,570	0.0069	0.59
24	DCASMA - Indianapolis, IN	4,185	0.0063	0.60
25	Tinker Air Force Base - Oklahoma City, OK	4,169	0.0063	0.60
26	DCASMA - Detroit, MI	3,953	0.0060	0.61

[a]Defense Contract Administration Service Management Area.

TABLE B-1

SHIPPING ACTIVITY REPORT (Continued)

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
27	McClellan Air Force Base – Sacramento, CA	3,445	0.0052	0.61
28	Defense Fuel Region – Tyndall, FL	3,362	0.0051	0.62
30	Sacramento Army Depot – Sacramento, CA	3,290	0.0050	0.62
31	Air Force Publication Distribution Center – Baltimore, MD	3,267	0.0049	0.63
32	Marine Corps Logistics Base – Albany, GA	3,203	0.0048	0.63
33	DCASMA – Boston, MA	3,199	0.0048	0.64
34	Naval Supply Center – Charleston, SC	3,042	0.0046	0.64
35	DCAS[b] – Santa Ana, CA	2,959	0.0045	0.65
36	DCASMA – Marietta, GA	2,947	0.0045	0.65
37	Naval Air Station – Corpus Christi, TX	2,848	0.0043	0.66
38	DCASMA – Orlando, FL	2,820	0.0043	0.66
39	DCASMA – Birmingham, AL	2,794	0.0043	0.66
40	Defense Fuel Region – St. Louis, MO	2,762	0.0042	0.67
41	Norton Air Force Base – San Bernardino, CA	2,609	0.0039	0.67
42	Defense Fuel Supply Center – Wrightstown, NJ	2,510	0.0038	0.68
43	DCASMA – St. Louis, MO	2,490	0.0038	0.68
44	Defense Fuel Region – San Pedro, CA	2,481	0.0038	0.69
45	Army Publication Center – Baltimore, MD	2,355	0.0036	0.69
46	DCASMA – Van Nuys, CA	2,209	0.0033	0.69
47	McGuire Air Force Base – Wrightstown, NJ	2,207	0.0033	0.70
48	Defense Fuel Region – Houston, TX	2,191	0.0033	0.70
49	Travis Air Force Base – Fairfield, CA	2,188	0.0033	0.70
50	Hill Air Force Base – Ogden, UT	2,152	0.0033	0.71
51	Fort Hood – Kileen, TX	2,149	0.0033	0.71
52	DCASMA – Cleveland, OH	2,073	0.0031	0.71
53	DCASMA – Inglewood, CA	2,046	0.0031	0.71
54	DCASMA – Philadelphia, PA	2,033	0.0031	0.72

[b]Defense Contract Administration Service.

TABLE B-1

SHIPPING ACTIVITY REPORT (Continued)

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
55	Naval Supply Center – San Diego, CA	1,996	0.0030	0.72
56	Naval Air Station – Alameda, CA	1,977	0.0030	0.72
57	DCASMA – Rochester, NY	1,853	0.0028	0.73
58	DCASMA – Milwaukee, WI	1,849	0.0028	0.73
60	AFPRO[c] Rockwell International Corporation – Columbus, OH	1,822	0.0028	0.73
61	DCASMA – Springfield, NJ	1,752	0.0027	0.74
62	DCASMA – Denver, CO	1,716	0.0026	0.74
63	DCASR[d] – San Francisco, CA	1,661	0.0025	0.74
64	DCASMA – Chicago, IL	1,621	0.0025	0.74
65	DCASMA – Dayton, OH	1,607	0.0024	0.75
66	Rock Island Arsenal – Rock Island, IL	1,602	0.0024	0.75
67	NAVMTO[e] – Norfolk, VA	1,542	0.0023	0.75
68	DCASMA – Towson, MD	1,538	0.0023	0.75
69	Wright-Patterson Air Force Base – Dayton, OH	1,518	0.0023	0.75
70	Naval Supply Center – Puget Sound, WA	1,425	0.0022	0.76
71	Naval Weapons Station – Yorktown, VA	1,411	0.0021	0.76
72	Naval Weapons Support Center – Crane, IN	1,390	0.0021	0.76
73	Naval Supply Center – Jacksonville, FL	1,385	0.0021	0.76
74	DCASMA – Hartford, CT	1,363	0.0021	0.76
75	Charleston Air Force Base – Charleston , SC	1,338	0.0020	0.77
76	Pease Air Force Base – Portsmouth, NH	1,334	0.0020	0.77
77	DCASMA – St. Paul, MN	1,300	0.0020	0.77
78	AFPRO General Dynamics Corporation – Fort Worth, TX	1,285	0.0019	0.77
79	Fort Ord – Monterey, CA	1,271	0.0019	0.77
80	Eglin Air Force Base – Valparaiso, FL	1,268	0.0019	0.77
81	Naval Air Station – Pensacola, FL	1,257	0.0019	0.78

[c]Air Force Program Representative Office.

[d]Defense Contract Administration Service Region.

[e]Navy Material Transportation Office.

TABLE B-1

SHIPPING ACTIVITY REPORT (Continued)

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
82	Army Ammunition Plant – McAlester, OK	1,257	0.0019	0.78
83	NAVPRO[f] – St. Louis, MO	1,252	0.0019	0.78
84	DCASMA – Reading, PA	1,214	0.0018	0.78
85	DCASMA – San Diego, CA	1,198	0.0018	0.79
86	Army Publication Center – St. Louis, MO	1,183	0.0018	0.79
87	NAVPRO Sikorsky Aircraft Division – Stratford, CT	1,121	0.0017	0.79
88	DCASMA – Garden City, NJ	1,117	0.0017	0.79
89	Camp Lejeune Marine Corps Base – Jacksonville, NC	1,116	0.0017	0.79
90	Seneca Army Depot – Romulus, NY	1,113	0.0017	0.79
91	Fort George G. Meade – Odenton, MD	1,060	0.0016	0.80
92	Fort Polk – Leesville, LA	1,055	0.0016	0.80
93	MOT[g] Bayonne – Bayonne, NJ	1,044	0.0016	0.80
94	DCASMA – Phoenix, AZ	1,038	0.0016	0.80
95	Edwards Air Force Base – Palmdale, CA	1,036	0.0016	0.80
96	Marine Corps Logistics Base – Barstow, CA	1,034	0.0016	0.80
97	Fort Lewis – Tacoma, WA	1,024	0.0015	0.81
98	Sierra Army Depot – Herlong, CA	1,022	0.0015	0.81
99	Fort Knox – Radcliff, KY	1,017	0.0015	0.81
100	Fort Carson – Colorado Spring, CO	976	0.0015	0.81
101	Army Ammunition Plant – Radford, VA	974	0.0015	0.81
102	Pueblo Depot Activity – Pueblo, CO	962	0.0015	0.81
103	Pine Bluff Arsenal – Pine Bluff, AR	960	0.0015	0.81
104	Nellis Air Force Base – Las Vegas, NV	958	0.0014	0.82
105	Naval Weapons Station – Concord, MA	958	0.0014	0.82
106	Philadelphia Naval Shipyard – Philadelphia, PA	935	0.0014	0.82
107	AFPRO Detachment 45 – Baltimore, MD	929	0.0014	0.82

[f]Navy Program Representative Office.

[g]Military Ocean Terminal.

TABLE B-1

SHIPPING ACTIVITY REPORT (Continued)

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
108	Fort Bragg – Fayetteville, NC	923	0.0014	0.82
109	Naval Air Station – Lemoore, CA	908	0.0014	0.82
110	Marine Corps Air Station – Cherry Point, NC	901	0.0014	0.82
111	DCASMA – Grand Rapids, MI	901	0.0014	0.83
112	Naval Training Center – Great Lakes, IL	901	0.0014	0.83
113	Aberdeen Proving Ground – Aberdeen, MD	893	0.0014	0.83
114	Naval Weapons Station – Seal Beach, CA	892	0.0013	0.83
115	Air Force Plant Representative Olaadeth – East Hartford, CT	871	0.0013	0.83
116	Army Ammunition Plant – Hawthorne, NV	860	0.0013	0.83
117	Fort Huachuca – Sierra Vista, AZ	839	0.0013	0.83
118	Carswell Air Force Base – Fort Worth, TX	810	0.0012	0.84
119	MOT Bay Area – Oakland, CA	809	0.0012	0.84
120	Redstone Arsenal – Huntsville, AL	804	0.0012	0.84
121	U.S. Army Armaments, Munitions, and Chemical Command – Rock Island, IL	795	0.0012	0.84
122	DCASMA – Seattle, WA	779	0.0012	0.84
123	Luke Air Force Base – Glendale, AZ	777	0.0012	0.84
124	Marine Corps Air Station – Santa Ana, CA	775	0.0012	0.84
125	AFPRO Lockheed-Georgia Company – Marietta, GA	774	0.0012	0.84
126	Naval Warfare Engineering Station – Keyport, FL	773	0.0012	0.84
127	Army Ammunition Plant – Milan, TN	770	0.0012	0.85
128	Cheatham Annex Naval Supply Center – Williamsburg, VA	739	0.0011	0.85
129	DCASMA – San Antonio, TX	720	0.0011	0.85
130	Fort Bliss – El Paso, TX	713	0.0011	0.85

TABLE B-1

SHIPPING ACTIVITY REPORT (Continued)

(September 1985 - February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
131	Naval Submarine Base - Groton, CT	707	0.0011	0.85
132	Marine Corps Air Station - Yuma, AZ	703	0.0011	0.85
133	Fort Campbell - Hopkinsville, KY	702	0.0011	0.85
134	AFPRO Detachment 34 - Wichita, KS	702	0.0011	0.85
135	McChord Air Force Base - Tacoma, WA	694	0.0010	0.85
136	Davis-Monthan Air Force Base - Tucson, AZ	682	0.0010	0.86
137	Gulf Outport - New Orleans, LA	681	0.0010	0.86
138	U.S. Army Courier Station - Odenton, MD	672	0.0010	0.86
139	DCAS - Bridgeport, CT	666	0.0010	0.86
140	Griffiss Air Force Base - Rome, NY	663	0.0010	0.86
141	Walter Reed Army Medical Center - Washington, DC	662	0.0010	0.86
142	NAVPRO Hercules Inc. - Magna, UT	662	0.0010	0.86
143	Fort Sill - Lawton, OK	644	0.0010	0.86
144	National Training Center and Fort Irwin - Fort Irwin, CA	626	0 0009	0.86
145	Naval Publications and Forms Center - Philadelphia, PA	619	0.0009	0.86
146	Naval Construction Battalion - Port Huenema, CA	612	0.0009	0.87
147	Energy Management Office - Kelly Air Force Base, TX	610	0.0009	0.87
	Total	572,495	0.8661	0.87
	Remaining Activities	88,596	0.1339	0.13
	Total	661,091	1.0000	1.00

TABLE B-2

U.S. ARMY FINANCE AND ACCOUNTING CENTER
SHIPPING ACTIVITY REPORT

(September 1985 - February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
1	Defense Depot - Memphis, TN	53,065	0.0816	0.08
2	Defense Depot - Mechanicsburg, PA	47,694	0.0734	0.16
3	Defense Depot - Ogden, UT	32,250	0.0496	0.20
4	Defense General Support Center - Richmond, VA	31,954	0.0492	0.25
5	Defense Depot - Tracy, CA	29,996	0.0461	0.30
6	Defense Personnel Support Center - Philadelphia, PA	26,503	0.0408	0.34
7	Red River Army Depot - Texarkana, TX	25,824	0.0397	0.38
8	New Cumberland Army Depot - New Cumberland, PA	21,830	0.0336	0.41
9	Defense Construction Supply Center - Columbus, OH	19,228	0.0296	0.44
10	Kelly Air Force Base - San Antonio, TX	13,777	0.0212	0.46
11	Letterkenny Army Depot - Chambersburg, PA	12,362	0.0190	0.48
13	Defense Supply Region - Alameda, CA	7,057	0.0109	0.49
15	Sharpe Army Depot - Lathrop, CA	6,719	0.0103	0.51
16	Robins Air Force Base - Warner-Robins, GA	6,685	0.0103	0.52
17	Dover Air Force Base - Dover, DE	6,234	0.0096	0.52
18	Tobyhanna Army Depot - Tobyhanna, PA	6,108	0.0094	0.53
19	Anniston Army Depot - Anniston, AL	5,930	0.0091	0.54
20	Tooele Army Depot - Tooele, UT	5,855	0.0090	0.55
21	Lexington Blue Grass Army Depot - Lexington, KY	5,696	0.0088	0.56
22	Rockwell International Corporation - Los Angeles, CA	5,503	0.0085	0.57
23	DCASMA - Dallas, TX	4,570	0.0070	0.58
24	DCASMA - Indianapolis, IN	4,185	0.0064	0.58
25	Tinker Air Force Base - Oklahoma City, OK	4,169	0.0064	0.59
26	DCASMA - Detroit, MI	3,953	0.0061	0.60
27	McClellan Air Force Base - Sacramento, CA	3,445	0.0053	0.60
28	Defense Fuel Region - Tyndall, FL	3,362	0.0052	0.61

TABLE B-2

U.S. ARMY FINANCE AND ACCOUNTING CENTER
SHIPPING ACTIVITY REPORT (Continued)

(September 1985 - February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
30	Sacramento Army Depot - Sacramento, CA	3,290	0.0051	0.61
31	Air Force Publication Distribution Center - Baltimore, MD	3,267	0.0050	0.62
33	DCASMA - Boston, MA	3,199	0.0049	0.62
35	DCAS - Santa Ana, CA	2,959	0.0046	0.63
36	DCASMA - Marietta, GA	2,947	0.0045	0.63
38	DCASMA - Orlando, FL	2,820	0.0043	0.63
39	DCASMA - Birmingham, AL	2,794	0.0043	0.64
40	Defense Ruel Region - St. Louis, MO	2,762	0.0042	0.64
41	Norton Air Force Base - San Bernardino, CA	2,609	0.0040	0.65
42	Defense Fuel Supply Center - Wrightstown, NJ	2,510	0.0039	0.65
43	DCASMA - St. Louis, MO	2,490	0.0038	0.65
44	Defense Fuel Region - San Pedro, CA	2,481	0.0038	0.66
45	Army Publication Center - Baltimore, MD	2,355	0.0036	0.66
46	DCASMA - Van Nuys, CA	2,209	0.0034	0.67
47	McGuire Air Force Base - Wrightstown, NJ	2,207	0.0034	0.67
48	Defense Fuel Region - Houston, TX	2,191	0.0034	0.67
49	Travis Air Force Base - Fairfield, CA	2,188	0.0034	0.68
50	Hill Air Force Base - Ogden, UT	2,152	0.0033	0.68
51	Fort Hood - Kileen, TX	2,149	0.0033	0.68
52	DCASMA - Cleveland, OH	2,073	0.0032	0.69
53	DCASMA - Inglewood, CA	2,046	0.0031	0.69
54	DCASMA - Philadelphia, PA	2,033	0.003 1	0.69
57	DCASMA - Rochester, NY	1,853	0.0029	0.69
58	DCASMA - Milwaukee, WI	1,849	0.0028	0.70
60	AFPRO Rockwell International Corporation - Columbus, OH	1,822	0.0028	0.70
61	DCASMA - Springfield, NJ	1,752	0.0027	0.70
62	DCASMA - Denver, CO	1,716	0.0026	0.71
63	DCASR - San Francisco, CA	1,661	0.0026	0.71
64	DCASMA - Chicago, IL	1,621	0.0025	0.71

TABLE B-2

U.S. ARMY FINANCE AND ACCOUNTING CENTER
SHIPPING ACTIVITY REPORT (Continued)

(September 1985 - February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
65	DCASMA - Dayton, OH	1,607	0.0025	0.71
66	Rock Island Arsenal - Rock Island, IL	1,602	0.0025	0.72
68	DCASMA - Towson, MD	1,538	0.0024	0.72
69	Wright-Patterson Air Force Base - Dayton, OH	1,518	0.0023	0.72
74	DCASMA - Hartford, CT	1,363	0.0021	0.72
75	Charleston Air Force Base - Charleston, SC	1,338	0.0021	0.72
76	Pease Air Force Base - Portsmouth, NH	1,334	0.0021	0.73
77	DCASMA - St. Paul, MN	1,300	0.0020	0.73
78	General Dynamics Corporation - Fort Worth, TX	1,285	0.0020	0.73
79	Fort Ord - Monterey, CA	1,271	0.0020	0.73
80	Eglin Air Force Base - Valparaiso, FL	1,268	0.0020	0.73
82	Army Ammunition Plant - McAlester, OK	1,257	0.0019	0.74
84	DCASMA - Reading, PA	1,214	0.0019	0.74
85	DCASMA - San Diego, CA	1,198	0.0018	0.74
86	Army Publication Center - St. Louis, MO	1,183	0.0018	0.74
88	DCASMA - Garden City, NJ	1,117	0.0017	0.74
90	Seneca Army Depot - Romulus, NY	1,113	0.0017	0.75
91	Fort George G. Meade - Odenton, MD	1,060	0.0016	0.75
92	Fort Polk - Leesville, LA	1,055	0.0016	0.75
93	MOT Bayonne - Bayonne, NJ	1,044	0.0016	0.75
94	DCASMA - Phoenix, AZ	1,038	0.0016	0.75
95	Edwards Air Force Base - Palmdale, CA	1,036	0.0016	0.75
97	Fort Lewis - Tacoma, WA	1,024	0.0016	0.75
98	Sierra Army Depot - Herlong, CA	1,022	0.0016	0.76
99	Fort Knox - Radcliff, KY	1,017	0.0016	0.76
100	Fort Carson - Colorado Spring, CO	976	0.0015	0.76
101	Army Ammunition Plant - Radford, VA	974	0.0015	0.76
102	Pueblo Depot Activity - Pueblo, CO	962	0.0015	0.76

TABLE B-2

U.S. ARMY FINANCE AND ACCOUNTING CENTER
SHIPPING ACTIVITY REPORT (Continued)

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
103	Pine Bluff Arsenal – Pine Bluff, AR	960	0.0015	0.76
104	Nellis Air Force Base – Las Vegas, NV	958	0.0015	0.77
107	AFPRO Detachment 45 – Baltimore, MD	929	0.0014	0.77
108	Fort Bragg – Fayetteville, NC	923	0.0014	0.77
111	DCASMA – Grand Rapids, MI	901	0.0014	0.77
113	Aberdeen Proving Ground – Aberdeen, MD	893	0.0014	0.77
115	Air Force Plant Representative Olaadeth – East Hartford, CT	871	0.0013	0.77
116	Army Ammunition Plant – Hawthorne, NV	860	0.0013	0.77
117	Fort Huachuca – Sierra Vista, AZ	839	0.0013	0.78
118	Carswell Air Force Base – Fort Worth, TX	810	0.0012	0.78
119	MOT Bay Area – Oakland, CA	809	0.0012	0.78
120	Redstone Arsenal – Huntsville, AL	804	0.0012	0.78
121	U.S. Army Armaments, Munitions, and Chemical Command – Rock Island, IL	795	0.0012	0.78
122	DCASMA – Seattle, WA	779	0.0012	0.78
123	Luke Air Force Base – Glendale, AZ	777	0.0012	0.78
125	AFPRO Lockheed-Georgia Company – Marietta, GA	774	0.0012	0.78
127	Army Ammunition Plant – Milan, TN	770	0.0012	0.78
129	DCASMA – San Antonio, TX	720	0.0011	0.79
130	Fort Bliss – El Paso, TX	713	0.0011	0.79
133	Fort Campbell – Hopkinsville, KY	702	0.0011	0.79
134	AFPRO Detachment 34 – Wichita, KS	702	0.0011	0.79
135	McChord Air Force Base – Tacoma, WA	694	0.0011	0.79
136	Davis-Monthan Air Force Base – Tuscon, AZ	682	0.0010	0.79
137	Gulf Outport – New Orleans, LA	681	0.0010	0.79
138	U.S. Army Courier Station – Odenton, MD	672	0.0010	0.79

TABLE B-2

U.S. ARMY FINANCE AND ACCOUNTING CENTER
SHIPPING ACTIVITY REPORT (Continued)

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
139	DCAS – Bridgeport, CT	666	0.0010	0.79
140	Griffiss Air Force Base – Rome, NY	663	0.0010	0.80
141	Walter Reed Army Medical Center – Washington, DC	662	0.0010	0.80
143	Fort Sill – Lawton, OK	644	0.0010	0.80
144	National Training Center and Fort Irwin – Fort Irwin, CA	626	0.0010	0.80
147	Energy Management Office – Kelly Air Force Base, TX	610	0.0009	0.80
	Total	519,562	0.7993	0.80

TABLE B-3

DEFENSE LOGISTICS AGENCY SHIPPING ACTIVITY REPORT

(September 1985 - February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
1	Defense Depot - Memphis, TN	53,065	0.0816	0.08
2	Defense Depot - Mechanicsburg, PA	47,694	0.0734	0.16
3	Defense Depot - Ogden, UT	32,250	0.0496	0.20
4	Defense General Supply Center - Richmond, VA	31,954	0.0492	0.25
5	Defense Depot - Tracy, CA	29,996	0.0461	0.30
6	Defense Personnel Support Center - Philadelphia, PA	26,503	0.0408	0.34
9	Defense Construction Supply Center - Columbus, OH	19,228	0.0296	0.37
13	Defense Supply Region - Alameda, CA	7,057	0.0109	0.38
22	Rockwell International Corporation - Los Angeles, CA	5,503	0.0085	0.39
28	Defense Fuel Region - Tyndall, FL	3,362	0.0052	0.39
40	Defense Fuel Region - St. Louis, MO	2,762	0.0042	0.40
42	Defense Fuel Supply Center - Wrightstown, NJ	2,510	0.0039	0.40
44	Defense Fuel Region - San Pedro, CA	2,481	0.0038	0.41
48	Defense Fuel Region - Houston, TX	2,191	0.0034	0.41
	Total	266,556	0.4101	.41

TABLE B-4

DEFENSE CONTRACT ADMINISTRATION SERVICE SHIPPING ACTIVITY REPORT

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
23	DCASMA – Dallas, TX	4,570	0.0070	0.01
24	DCASMA – Indianapolis, IN	4,185	0.0064	0.01
26	DCASMA – Detroit, MI	3,953	0.0061	0.02
33	DCASMA – Boston, MA	3,199	0.0049	0.02
35	DCAS – Santa Ana, CA	2,959	0.0046	0.03
36	DCASMA – Marietta, GA	2,947	0.0045	0.03
38	DCASMA – Orlando, FL	2,820	0.0043	0.04
39	DCASMA – Birmingham, AL	2,794	0.0043	0.04
43	DCASMA – St. Louis, MO	2,490	0.0038	0.05
46	DCASMA – Van Nuys, CA	2,209	0.0034	0.05
52	DCASMA – Cleveland, OH	2,073	0.0032	0.05
53	DCASMA – Inglewood, CA	2,046	0.0031	0.06
54	DCASMA – Philadelphia, PA	2,033	0.0031	0.06
57	DCASMA – Rochester, NY	1,853	0.0029	0.06
58	DCASMA – Milwaukee, WI	1,849	0.0028	0.06
61	DCASMA – Springfield, NJ	1,752	0.0027	0.07
62	DCASMA – Denver, CO	1,716	0.0026	0.07
63	DCASR – San Francisco, CA	1,661	0.0026	0.07
64	DCASMA – Chicago, IL	1,621	0.0025	0.07
65	DCASMA – Dayton, OH	1,607	0.0025	0.08
68	DCASMA – Towson, MD	1,538	0.0024	0.08
74	DCASMA – Hartford, CT	1,363	0.0021	0.08
77	DCASMA – St. Paul, MI	1,300	0.0020	0.08
84	DCASMA – Reading, PA	1,214	0.0019	0.09
85	DCASMA – San Diego, CA	1,198	0.0018	0.09
88	DCASMA – Garden City, NJ	1,117	0.0017	0.09
94	DCASMA – Phoenix, AZ	1,038	0.0016	0.09
111	DCASMA – Grand Rapids, MI	901	0.0014	0.09
122	DCASMA – Seattle, WA	779	0.0012	0.09
129	DCASMA – San Antonio, TX	720	0.0011	0.09
139	DCAS – Bridgeport, CT	666	0.0010	0.10
	Total	62,171	0.0955	0.10

TABLE B-5

ARMY SHIPPING ACTIVITY REPORT

(September 1985 - February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
7	Red River Army Depot - Texarkana, TX	25,824	0.0397	0.04
8	New Cumberland Army Depot - New Cumberland, PA	21,830	0.0336	0.07
11	Letterkenny Army Depot - Chambersburg, PA	12,362	0.0190	0.09
15	Sharpe Army Depot - Lathrop, CA	6,719	0.0103	0.10
18	Tobyhanna Army Depot - Tobyhanna, PA	6,108	0.0094	0.11
19	Anniston Army Depot - Anniston, AL	5,930	0.0091	0.12
20	Tooele Army Depot - Tooele, UT	5,855	0.0090	0.13
21	Lexington Blue Grass Army Depot - Lexington, KY	5,696	0.0088	0.14
30	Sacramento Army Depot - Sacramento, CA	3,290	0.0051	0.14
45	Army Publication Center - Baltimore, MD	2,355	0.0036	0.15
51	Fort Hood - Kileen, TX	2,149	0.0033	0.15
66	Rock Island Arsenal - Rock Island, IL	1,602	0.0025	0.15
79	Fort Ord - Monterey, CA	1,271	0.0020	0.16
82	Army Ammunition Plant - McAlester, OK	1,257	0.0019	0.16
86	Army Publication Center - St. Louis, MO	1,183	0.0018	0.16
90	Seneca Army Depot - Romulus, NY	1,113	0.0017	0.16
91	Fort George G. Meade - Odenton, MD	1,060	0.0016	0.16
92	Fort Polk - Leesville, LA	1,055	0.0016	0.16
93	MOT Bayonne - Bayonne, NJ	1,044	0.0016	0.17
97	Fort Lewis - Tacoma, WA	1,024	0.0016	0.17
98	Sierra Army Depot - Herlong, CA	1,022	0.0016	0.17
99	Fort Knox - Radcliff, KY	1,017	0.0016	0.17
100	Fort Carson - Colorado Spring, CO	976	0.0015	0.17
101	Army Ammunition Plant - Radford, VA	974	0.0015	0.17
102	Pueblo Depot Activity - Pueblo, CO	962	0.0015	0.17
103	Pine Bluff Arsenal - Pine Bluff, AR	960	0.0015	0.18

TABLE B-5

ARMY SHIPPING ACTIVITY REPORT (Continued)

(September 1985 - February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
108	Fort Bragg - Fayetteville, NC	923	0.0014	0.18
113	Aberdeen Proving Ground - Aberdeen, MD	893	0.0014	0.18
116	Army Ammunition Plant - Hawthorne, NV	860	0.0013	0.18
117	Fort Huachuca - Sierra Vista, AZ	839	0.0013	0.18
119	MOT Bay Area - Oakland, CA	809	0.0012	0.18
120	Redstone Arsenal - Huntsville, AL	804	0.0012	0.18
121	U.S. Army Armaments, Munitions, and Chemical Command - Rock Island, IL	795	0.0012	0.19
127	Army Ammunition Plant - Milan, TN	770	0.0012	0.19
130	Fort Bliss - El Paso, TX	713	0.0011	0.19
133	Fort Campbell - Hopkinsville, KY	702	0.0011	0.19
137	Gulf Outport - New Orleans, LA	681	0.0010	0.19
138	U.S. Army Courier Station - Odenton, MD	672	0.0010	0.19
141	Walter Reed Army Medical Center - Washington, DC	662	0.0010	0.19
143	Fort Sill - Lawton, OK	644	0.0010	0.19
144	National Training Center and Fort Irwin - Fort Irwin, CA	626	0.0010	0.19
	Total	126,031	0.1939	0.19

TABLE B-6

AIR FORCE SHIPPING ACTIVITY REPORT

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
10	Kelly Air Force Base – San Antonio, TX	13,777	0.0212	0.02
16	Robins Air Force Base – Warner-Robins, GA	6,685	0.0103	0.03
17	Dover Air Force Base – Dover, DE	6,234	0.0096	0.04
25	Tinker Air Force Base – Oklahoma City, OK	4,169	0.0064	0.05
27	McClellan Air Force Base – Sacramento, CA	3,445	0.0053	0.05
31	Air Force Publication Distribution Center – Baltimore, MD	3,267	0.0050	0.06
41	Norton Air Force Base – San Bernardino, CA	2,609	0.0040	0.06
47	McGuire Air Force Base – Wrightstown, NJ	2,207	0.0034	0.07
49	Travis Air Force Base – Fairfield, CA	2,188	0.0034	0.07
50	Hill Air Force Base – Ogden, UT	2,152	0.0033	0.07
60	AFPRO Rockwell International Corporation – Columbus, OH	1,822	0.0028	0.07
69	Wright-Patterson Air Force Base – Dayton, OH	1,518	0.0023	0.08
75	Charleston Air Force Base – Charleston, SC	1,338	0.0021	0.08
76	Pease Air Force Base – Portsmouth, NH	1,334	0.0021	0.08
78	General Dynamics Corporation – Fort Worth, TX	1,285	0.0020	0.08
80	Eglin Air Force Base – Valparaiso, FL	1,268	0.0020	0.09
95	Edwards Air Force – Palmdale, CA	1,036	0.0016	0.09
104	Nellis Air Force Base – Las Vegas, NV	958	0.0015	0.09
107	AFPRO Detachment 45 – Baltimore, MD	929	0.0014	0.09
115	Air Force Plant Representative Olaadeth – East Hartford, CT	871	0.0013	0.09
118	Carswell Air Force Base – Fort Worth, TX	810	0.0012	0.09
123	Luke Air Force Base – Glendale, AZ	777	0.0012	0.09
125	AFPRO Lockheed-Georgia Company – Marietta, GA	774	0.0012	0.09
134	AFPRO Detachment 34 – Wichita, KS	702	0.0011	0.10
135	McChord Air Force Base – Tacoma, WA	694	0.0011	0.10
136	Davis-Monthan Air Force Base – Tuscon, AZ	682	0.0010	0.10
140	Griffiss Air Force Base – Rome, NY	663	0.0010	0.10
147	Energy Management Office – Kelly Air Force Base, TX	610	0.0009	0.10
	Total	64,804	0.0997	0.10

TABLE B-7

NAVY SHIPPING ACTIVITY REPORT

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
12	Naval Supply Center – Norfolk, VA	8,948	0.0138	0.01
14	Naval Supply Center – Oakland, CA	6,901	0.0106	0.02
34	Naval Supply Center – Charleston, SC	3,042	0.0047	0.03
37	Naval Air Station – Corpus Christi, TX	2,848	0.0044	0.03
55	Naval Supply Center – San Diego, CA	1,996	0.0031	0.04
56	Naval Air Station – Alameda, CA	1,977	0.0030	0.04
67	NAVMTO – Norfolk, VA	1,542	0.0024	0.04
70	Naval Supply Center – Puget Sound, WA	1,425	0.0022	0.04
71	Naval Weapons Station – Yorktown, VA	1,411	0.0022	0.05
72	Naval Weapons Support Center – Crane, IN	1,390	0.0021	0.05
73	Naval Supply Center – Jacksonville, FL	1,385	0.0021	0.05
81	Naval Air Station – Pensacola, FL	1,257	0.0019	0.05
83	NAVPRO – St. Louis, MO	1,252	0.0019	0.05
87	NAVPRO Sikorsky Aircraft Division – Stratford, CT	1,121	0.0017	0.06
105	Naval Weapons Station – Concord, MA	958	0.0015	0.06
106	Philadelphia Naval Shipyard – Philadelphia, PA	935	0.0014	0.06
109	Naval Air Station – Lemoore, CA	908	0.0014	0.06
112	Naval Training Center – Great Lakes, IL	901	0.0014	0.06
114	Naval Weapons Station – Seal Beach, CA	892	0.0014	0.06
126	Naval Warfare Engineering Station – Keyport, FL	773	0.0012	0.06
128	Cheatham Annex Naval Supply Center – Williamsburg, VA	739	0.0011	0.07
131	Naval Submarine Base – Groton, CT	707	0.0011	0.07
142	NAVPRO Hercules Inc. – Magna, UT	662	0.0010	0.07
145	Naval Publications and Forms Center – Philadelphia, PA	619	0.0010	0.07
146	Naval Construction Battalion – Port Huenema, CA	612	0.0009	0.07
	Total	45,201	0.0695	0.07

TABLE B-8

MARINE CORPS ACTIVITY REPORT

(September 1985 – February 1986)

DoD rank	Shipping activity	Number of shipments	Percent of total	Cumulative percentage
32	Marine Corps Logistics Base – Albany, GA	3,203	0.0049	.00
89	Camp Lejeune Marine Corps Base – Jacksonville, NC	1,116	0.0017	0.01
96	Marine Corps Logistics Base – Barstow, CA	1,034	0.0016	0.01
110	Marine Corps Air Station – Cherry Point, NC	901	0.0014	0.01
124	Marine Corps Air Station – Santa Ana, CA	775	0.0012	0.01
132	Marine Corps Air Station – Yuma, AZ	703	0.0011	0.01
	Total	7,732	0.0119	0.01

APPENDIX C

FREIGHT CARRIER INDUSTRY SURVEY

We conducted a telephone survey of the freight carrier industry to determine current and future Electronic Data Interchange (EDI) investment plans and the likelihood of deriving a methodology for predicting EDI investment based on carrier characteristics. Since the freight carriers are a critical component of DoD's EDI program, their commitment to investing in EDI will influence greatly the success of that program.

In our survey, we contacted the top 22 DoD carriers representing 48 percent of all DoD's CONUS freight shipments. Our initial questions separated the carriers into three categories: those that are currently EDI capable, those that are planning to develop the capability, and those with no current or planned EDI capability. Then for those carriers with current or planned EDI capabilities, we questioned their use of transaction sets (EDI standards); their trading partners; their volume of shipping; their perceived value of EDI; their hardware approach (i.e., mainframe, minicomputer, or microcomputer); their software approach (i.e., make, buy, or service); their telecommunications resources; and their operational and organizational changes. We considered any carrier that was committed to transaction sets was also committed to EDI.

Table C-1 shows the carriers who have invested in EDI at the time of this survey, March 1987. The Transportation Data Coordinating Committee) transaction sets, or standards, they are using include:

- 210 – Freight Billing
- 214 – Shipment Status
- 204 – Shipment Information
- 820 – Remittance Advice
- 997 – Functional Acknowledgment

- 994 – Administrative Message
- 980 – Functional Group Totals.

TABLE C-1

SURVEY FINDINGS OF TOP 22 CARRIERS REPRESENTING 48 PERCENT OF DoD SHIPMENTS

Transmit EDI standards electronically	Transmit EDI standards via tape	No transmissions	No contact
Consolidated Freightways	St Johnsbury Trucking	Preston Trucking	McLean Trucking
ABF Freight System	Mistletoe Express Service	Watkins Motor Lines	Coast Counties Express
Roadway Express		Tri State Motor Transit	Campbell Sixty Six Express
Yellow Freight System		Smith's Transfer	
Transcon Lines		Milne Truck Lines	
Overnite Transportation			
Bowman Transportation			
Thurston Motor Lines			
PIE Nationwide			
Garrett Freightlines			
Carolina Freight Carriers			
Pilot Freight Carriers			

Fourteen of the carriers surveyed, representing 38 percent of DoD's CONUS freight shipments, had already invested in EDI capabilities, mostly in the freight invoice transaction set, because of the perception it would help them achieve a favorable cash-flow position. The profiles of these carriers show a wide range in revenue, operating ratio, and profit. The carriers that had not invested did indicate that they would do so as the market required. We found that 3 of the 22 carriers were no longer in business. Finally, the carriers committed to EDI are using four different network service vendors, with the most popular being TranSettlements, Inc

Another survey conducted by the American Trucking Association shows that 52 of 200 responders purchased software for EDI applications and 87 of the remainder indicate intentions to use EDI in the future.

These surveys substantiate the conclusion that the carriers are positioning themselves to send the freight invoice electronically and, to a lesser extent, to send the shipment status or receive the shipment information transaction sets. Carrier characteristics were too varied to be of much assistance in deriving a methodology for predicting carrier EDI investment.

APPENDIX D

DETAILED IMPLEMENTATION WORK PLANS

This appendix presents detailed plans for implementing the six tasks described in Chapter 3 for DoD's short-term Electronic Data Interchange (EDI) program. Each of the tasks is divided into subtasks and activities, and a schedule for completing the subtasks is then provided.

TASK 1: ESTABLISH A PROGRAM OFFICE

The first step in implementing an EDI program is to establish a program office to coordinate all other implementation actions. The two subtasks in this step, Initiate Task and Organize Program Office, are shown in Figure D-1 along with specific activities required in each.

Initiate Task

The Assistant Secretary of Defense (Production and Logistics), ASD(P&L), needs to determine the role of the program office, assign its responsibilities, and establish its organizational location.

Organize Program Office

Once the program office has been established, then the ASD(P&L) needs to determine the resource and funding requirements and to select and train the personnel to staff the office.

TASK 2: UPGRADE USAFAC'S OPERATION

Upgrading the electronic processing capabilities at the U.S. Army Finance and Accounting Center (USAFAC) Transportation Operations Directorate (referred to here simply as USAFAC) is the pacing task in the short-term implementation plan. (These capabilities include, as detailed in Chapter 3, receiving shipment information and freight invoices electronically and then automatically matching shipment information with invoices, taking advantage of carrier discounts, paying invoices, generating shipment information, and maintaining acceptable audit trails.) The

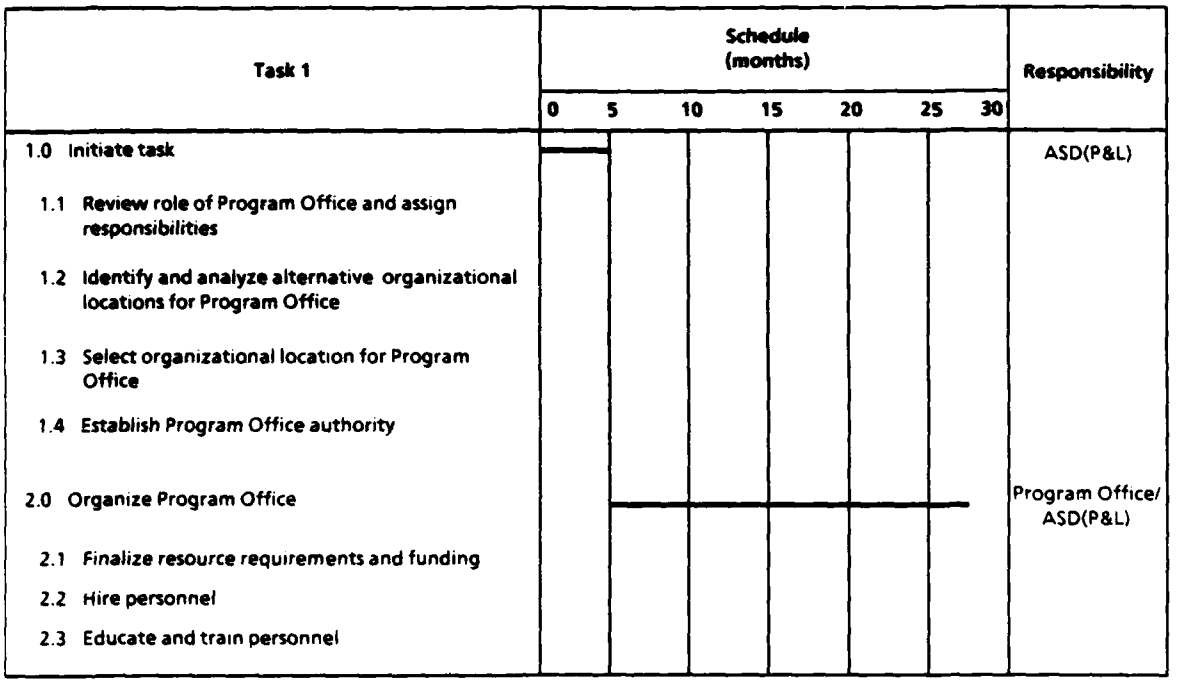


FIG. D-1. WORK PLAN FOR TASK 1: ESTABLISH A PROGRAM OFFICE

completion of this task will mark the beginning of EDI operations. This task is divided into five subtasks as shown in Figure D-2.

Initiate Task

Upgrading USAFAC operations is a cooperative effort that involves USAFAC, the Military Services, the EDI Program Office, the Logistics Management Institute (LMI), and a contractor. The initial activities involve the selection of the contractor. LMI will identify several potential contractors to define the EDI functional requirements and to design the system to meet those requirements. The selected contractor will have extensive experience in such areas as workflow, office automation, and financial system design and development.

With the assistance of USAFAC, LMI will prepare a request for proposal for system definition and design, solicit prospective contractors, evaluate proposals, and award a contract.

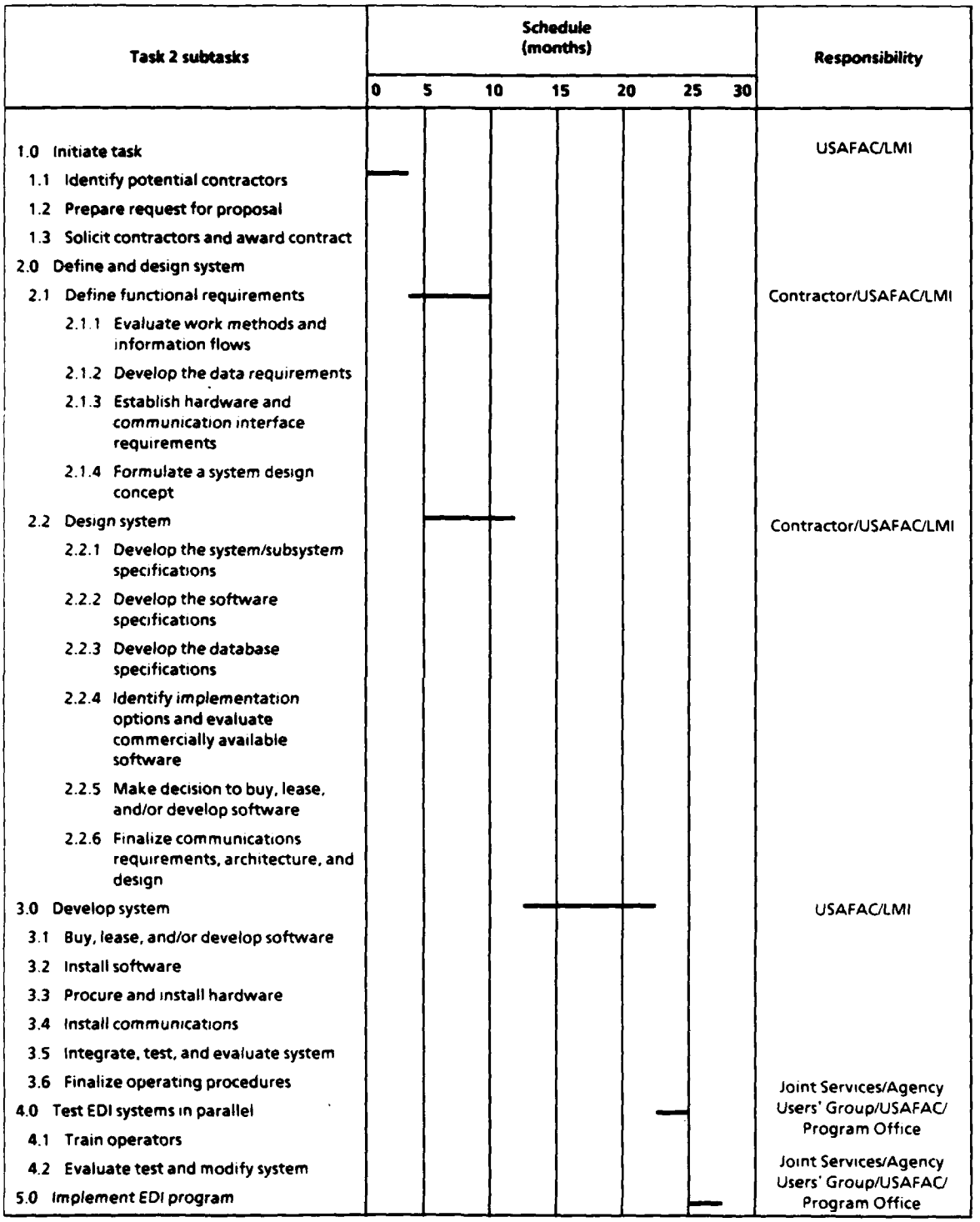


FIG. D-2. WORK PLAN FOR TASK 2: UPGRADE USAFAC'S OPERATIONS

Define and Design System

This subtask includes both defining the functional requirement and designing the system. The contractor will be responsible for both subtasks in coordination with LMI and USAFAC. The definition of functional requirements includes evaluating USAFAC work methods and information flows, developing data requirements, establishing hardware and communications interface requirements, and formulating a system design concept based on the short-term operating design concept as presented in Chapter 3. The system design encompasses designing the system, software, and database specifications, including the software design logic, file formats, and screen-and-report layouts.

After the contractor has completed the definition and design subtasks, LMI and USAFAC will identify implementation options that satisfy the specified design requirements. These options could include, inter alia, building the system in-house at USAFAC, custom-designing it commercially, purchasing commercially available software, or modifying existing software. The final design task includes finalizing communication requirements, architecture, and design.

DoD Standard 7920.1, *Life Cycle Management of Automated Information System*, which documents the development phases of automated informations systems, will be followed during implementation. Several documents will be prepared in this task: functional description, data requirements document, system specification, program specification, database specification, users' manual, program maintenance manual, test plan, test analysis report, and implementation procedures. DoD Standard 7935, *Automated Data Systems Documentation*, provides the guidelines for developing these documents.

Develop System

In this subtask, the software that meets specifications will be purchased, leased and/or developed, and installed; the hardware will be procured and installed; and the communications interface will be installed. These components will be integrated, tested, evaluated, and the problems corrected. In addition, operating procedures will be finalized by identifying required modifications and preparing new procedures to address new operating methods.

Test EDI Systems in Parallel/Implement EDI Program

These subtasks represent a coordinated effort among the Military Services, Defense Logistics Agency (DLA), USAFAC, and the EDI Program Office to integrate the major activities, including the shippers' systems, the communication network, and the USAFAC system, and then test them in parallel without disrupting current operations. Problems with the EDI systems will be corrected before the program goes into final operation.

TASK 3: ADD EDI CAPABILITY AT 145 SHIPPING POINTS

The 145 largest DoD shipping points account for over 85 percent of all cargo movement, and, as such, should be capable of sending and receiving business electronically. In Task 3, those 145 shipping points will be given the capability to transmit and receive transportation information electronically. That effort will be coordinated by a Joint Service/Agency Users' Group and the EDI Program Office. Initially, that Group will concentrate on installing EDI capability at the 61 highest volume shipping points in DLA, the Army, and the Air Force.

Implementation Schedule

In accordance with the short-term operating concept, the shipping activity implementation schedule initially focuses on shipping activities doing business with USAFAC. Those activities are scheduled for EDI capability in 1989 and 1990 following the upgrading of USAFAC. They include the 114 largest shipping points from DLA, the Army, and the Air Force, representing more than 85 percent of USAFAC's volume. That initial focus then shifts to 25 Navy shipping activities, representing 69 percent of the Navy payment center's volume and 6 Marine Corps shipping activities, representing 77 percent of the Marine Corps payment center's volume. The Navy and Marine Corps shipping activities are scheduled for EDI capability in 1990 and 1991 following the upgrading of their respective payment centers. The implementation schedule is shown in Table D-1.

DLA Shipping Activities

DLA shipping activities are of primary importance to the EDI program because they constitute approximately 45 percent of USAFAC's business. That volume increases to 56 percent when the Defense Contract Administration Service (DCAS) is added to the implementation schedule. The upgrading of DCAS operations is

TABLE D-1

SHIPPING ACTIVITY IMPLEMENTATION SCHEDULE

DoD component	Number of activities			Percent of shipments	Implementation schedule									Appendix identification reference
					FY89			FY90			FY91			
	Micros	Main-frames	Total		# of micros	# of main-frames	%	# of micros	# of main-frames	%	# of micros	# of main-frames	%	
DLA														
Defense Activities	7	7	14	45 5	7	7	45 5	0	0	—	0	0	—	Table B-3
DCAS Activities	[a]	[a]	31	10 6	[a]	[a]	10 6	0	0	—	0	0	—	Table B-4
Army														
Area Oriented Depots	0	3	3	9 3	0	3	9 3	0	0	—	0	0	—	Table B-5
Army Depots	7	1	8	7 1	7	1	7 1	0	0	—	0	0	—	
TC ACCIS Activities[b]	14	0	14	2 4	0	0	—	14	0	2 4	0	0	—	
Other Army Activities	16	0	16	2 8	0	0	—	16	0	2.8	0	0	—	
Air Force														
Air Logistics Centers	0	5	5	5 2	0	5	5 2	0	0	—	0	0	—	Table B-6
Other Air Force Activities	23	0	23	5 9	0	0	—	23	0	5 9	0	0	—	
Total USAFAC	67	16	114	88 8	14	16	77.7	53	0	11.1	0	0	—	
Navy														
Naval Supply Centers	0	6	6	36 1	0	0	—	6	0	36 1	0	0	—	Table B-7
Other Navy Activities	19	0	19	32 8	0	0	—	10	0	22 4	9	0	10 4	
Total NAVMTO	19	6	25	68 9	0	0	—	16	0	58 5	9	0	10 4	
Marine Corps Activities	6	0	6	76 7	0	0	—	6	0	76 7	0	0	—	Table B-8

[a]Equipment requirements are being determined by the TRAMS initiative.

[b]This represents the 14 TC ACCIS (Transportation Coordinator Automated Command and Control Information System) initiative activities which overlap with the top 145 shipping activities.

being funded by the Transportation Automated Management System (TRAMS) initiative. The DLA activities are scheduled to be EDI capable by the end of 1989. The following DLA activities will require mainframe translation software: Defense Depots at Memphis, Tenn.; Mechanicsburg, Pa.; Ogden, Utah; and Tracy, Calif.; and supply centers at Richmond,Va.; Philadelphia, Pa.; and Columbus, Ohio.

Army Shipping Activities

Army shipping activities comprise Area Oriented Depots, other Army depots, Transportation Coordinator Automated Command and Control Information System (TC ACCIS) activities, and other Army shipping activities that are among the largest 145 DoD shipping activities.

To become EDI-capable, the three Area Oriented Depots – Red River in Texarkana, Tex.; New Cumberland, Pa.; and Sharpe in Lathrop, Calif.; and one Army depot, Letterkenny in Chambersburg, Pa., will probably require mainframe translation software. Seven other depots, Tobyhanna, Pa.; Anniston, Ala.; Tooele, Utah; Lexington-Blue Grass, Ky.; Sacramento, Calif.; Seneca in Romulus, N.Y.; and Sierra in Herlong, Calif., can probably utilize microcomputer translation software. These ten activities, making up approximately 16 percent of USAFAC's volume, are scheduled for EDI implementation in 1989.

The TC ACCIS initiative will use microcomputers to automate much of its shipping function, including the generation of shipment information at smaller Army activities. Fourteen TC ACCIS activities overlap the top 145 DoD shipping activities: Fort Hood, Tex.; Fort Ord, Calif.; Fort George Meade, Md.; Fort Polk, La.; Fort Lewis, Wash.; Fort Knox, Ky.; Fort Carson, Colo.; Fort Bragg, N.C.; Aberdeen Proving Ground, Md.; Fort Huachuca, Ariz.; Fort Bliss, Tex.; Fort Campbell, Ky.; Fort Sill, Okla.; and Fort Irwin, Calif. Since these installations will use microcomputers, they must be provided with microcomputer translation software. The 16 remaining non-TC-ACCIS Army activities that will use microcomputers are shown in Table B-5 of Appendix B. The TC ACCIS activities and remaining Army activities, which together make up approximately 5 percent of USAFAC's volume, are scheduled for EDI implementation in 1990.

Air Force Shipping Activities

Air Force shipping activities are separated into two categories: Air Logistics Centers and other Air Force installations. We believe that at least one Air Logistics Center, Kelly Air Force Base in San Antonio, Tex., will require mainframe translation software because of its shipping volume; the other four, Robins in Warner-Robins, Ga.; Hill in Oden, Utah; Tinker in Oklahoma City, Okla.; and McClellan in Sacramento, Calif., should also use mainframe translation software because of the similarity of their information systems and missions. Air Logistics Centers make up approximately 5 percent of USAFAC's volume and are scheduled for EDI implementation in 1989.

The other Air Force activities, representing 6 percent of USAFAC's volume, will most likely require microcomputer translation software. Those activities, scheduled for implementation in 1990, are shown in Table B-6 of Appendix B.

Navy Shipping Activities

Navy shipping activities consist of two categories: the six Navy Supply Centers and other Navy activities. The supply centers, located in Norfolk, Va.; Oakland, Calif.; Charleston, S.C.; San Diego, Calif.; Puget Sound, Wash.; and Jacksonville, Fla., will probably require mainframe translation software because of the commonalty of their information systems and the volume requirement at Norfolk. Altogether, these shipping activities account for 36 percent of the Navy payment center's volume. They are scheduled for implementation in 1990.

The other 19 Navy activities, shown in Table B-7 of Appendix B, will probably use microcomputer translation software. One-half of those are scheduled for EDI implementation in 1990 and the other half in 1991.

Marine Corps Shipping Activities

Six Marine Corps shipping activities – those at Albany, Ga.; Jacksonville, N.C.; Barstow, Calif.; Cherry Point, N.C.; Santa Ana, Calif.; and Yuma, Ariz. – are included in DoD's top 145 shipping activities. Their shipping volume, however, is small enough to permit them to utilize microcomputer translation software. They are scheduled for implementation in 1990.

The work plan for installing EDI capability at the 145 shipping points calls for five subtasks, as shown in Figure D-3.

Initiate Task

Task 3 is initiated by the Military Services reviewing the EDI test results and the long-term plan for EDI, and then establishing a Joint Service/Agency Users' Group. This Group will be responsible for developing a consensus on general operating concepts and for carrying out the balance of the task.

Define and Design System

This subtask involves defining the functional requirements and designing the EDI shipping-point system. The activities involved in defining the functional requirements are shown as Items 2.1.1 through 2.1.5 in Figure D-3. In order to define the functional requirements, the current business environment at each shipping point will need to be evaluated. The activities involved in designing the EDI system at shipping points are shown as Items 2.2.1 through 2.2.3 in Figure D-3.

The Joint Services/Agency Users' Group will be responsible for defining and designing the shipping point EDI system, under the general coordination of the EDI Program Office.

Develop System/Test EDI Systems in Parallel/Implement EDI Program

The final three subtasks are identical in structure and content to those described previously for upgrading USAFAC's operations. The only exception is the inclusion of establishing trading partners during the testing of EDI systems in parallel with regular production. That task is specific to installing EDI capability at shipping points, and it requires assistance from the Military Traffic Management Command (MTMC) to identify trading partners and to establish procedures for obtaining carrier participation.

TASK 4: CONFIGURE THE COMMUNICATIONS NETWORK

Configuring the communications network is a major task that requires a telecommunications capability for transferring information and a value-added network (VAN) service for storing and forwarding batch EDI transmissions. The

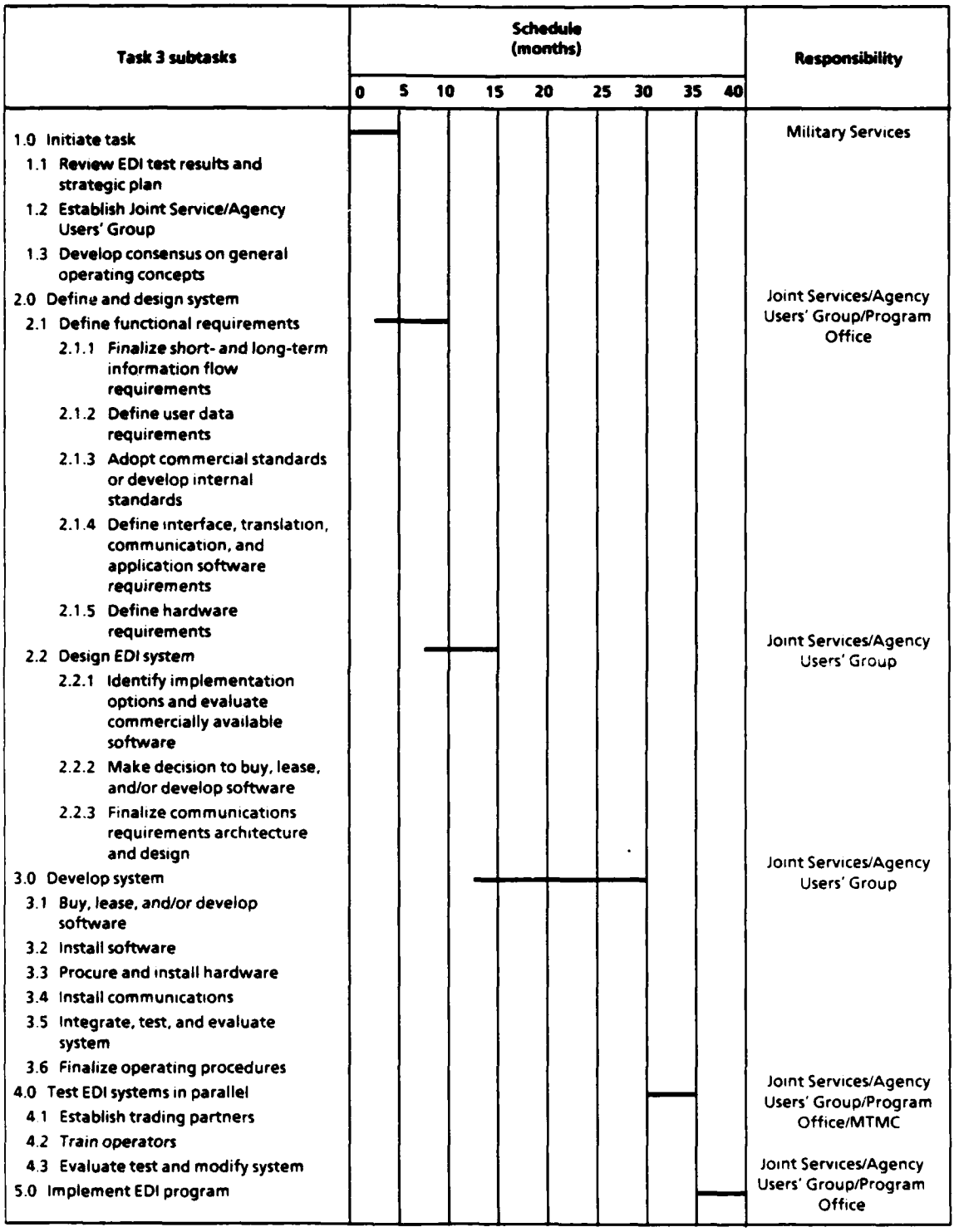


FIG. D-3. WORK PLAN FOR TASK 3: INSTALL EDI CAPABILITY AT SHIPPING POINTS

objective of this task is to create a communications network that will support all DoD users regardless of their equipment types, locations, and usage.

This task is closely related to two other tasks: upgrading USAFAC's operations and adding EDI capability at 145 shipping points. Since both of these other tasks require a communications network, all organizations involved – Military Services, DLA, MTMC, and USAFAC – should share responsibility for carrying out this task. The six subtasks in configuring a communications network and the activities embedded in those subtasks are shown in Figure D-4.

Initiate Task

The task initiation includes reviewing the DoD EDI test results and DoD's long-term plan for EDI, establishing a Joint Service/Agency Users' Group for communications, and developing a consensus on the general operating concept. That consensus should be tied closely with the operating concept developed during the installation of EDI capability at the 145 shipping points.

Define and Design Telecommunications

The objective of this subtask is to define the communications requirements, service needs, and costs associated with DoD's EDI program and to design a network architecture that will satisfy those requirements.

After the communications requirements have been developed, they must be submitted to the Defense Communications Agency following established request-for-service [through the Defense Data Network (DDN)] procedures. The DDN then will indicate its ability to provide the required service. If it cannot, then alternative communications options will need to be pursued. Listed below are the steps that need to be taken to define the communications requirements and to develop a final communications architecture.

- Reach consensus on EDI operating concept, considering:
  - Functionality and purpose
  - Data movements
  - User requirements (display screen, printer, security, etc.)
  - User profile (average use, volumes, times, etc.)

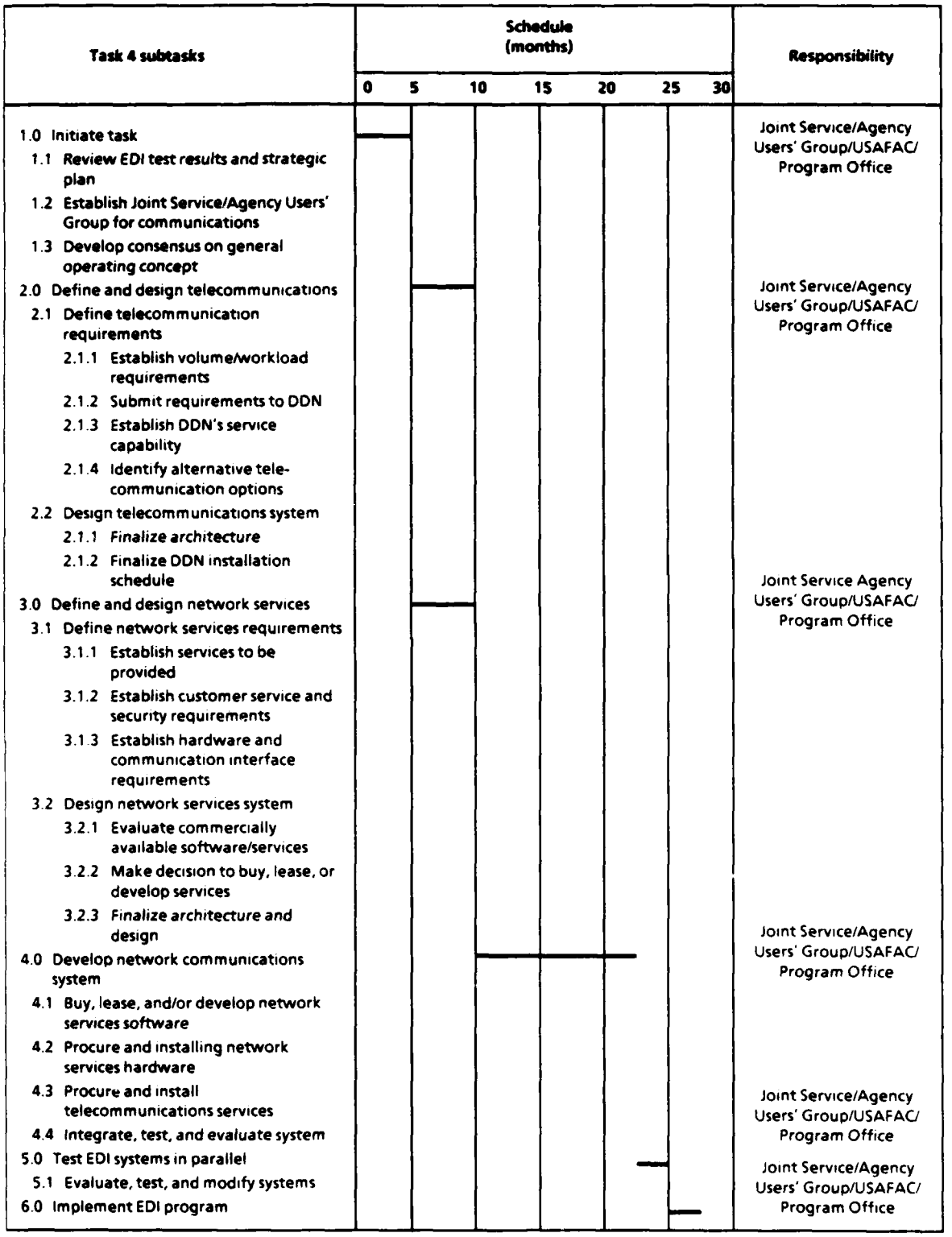


FIG. D-4. WORK PLAN FOR TASK 4: CONFIGURE THE COMMUNICATIONS NETWORK

- Define basic communications requirements, including:
  - Hosts to be supported and available communications methods
  - User communications requirements (local area networks, terminal speeds, protocols, etc.)
  - Current and planned locations
  - Number of users per location
  - Security
- Determine communication mandates, including:
  - Government requirements/DDN mandates
    - Use of Government facilities
    - Acquisition requirements and restrictions (if any)
    - Security
  - How the system must be accessed
  - Response times
  - Availability
- Identify operational considerations, including:
  - How users will obtain service
  - How service will be installed
  - Installation coordination
  - Trouble reporting and resolution
  - Expansion/new services/new features
  - Who will pay for communications costs
  - How users will be billed (for installation or part of usage)
  - How billing will be provided (gathering and integration)
  - How increases in tariff/equipment costs will be handled
  - Format of any billing/charging reports

- Investigate communications solutions, alternatives, abilities, contractors, and pricing, including:
  - Verify user categories
  - Define basic architecture and support requirements
  - Identify organizations that can support requirements (subsets)
    - DDN
    - Public networks
- Develop final architecture, including:
  - Define architecture to support shipping points and DoD systems
  - Define architecture(s) to support end users
  - Break out user categories with types of services to support them, given any limitations (e.g., current DDN user must stay on DDN)
  - Define how users would use suggested/selected systems.

Define and Design Network Services

In defining VAN service requirements, such services as document handling and distribution, administration, customer service, and security need to be considered as do the hardware and communication interface requirements. The specific activities in this task are presented as Items 3.2.1, 3.2.2, and 3.2.3 in Figure D-4.

Develop Network Communications System

The activities included in developing the communications system are shown as Items 4.1 through 4.4 in Figure D-4.

Test EDI Systems In Parallel/Implement EDI Program

These two subtasks must be performed in conjunction with upgrading USAFAC's operations and installing EDI at 145 shipping points.

TASK 5: RESOLVE OPERATING REGULATION, POLICY, AND PROCEDURE ISSUES

This task requires a coordinated effort among all project participants. EDI will significantly change paper-oriented regulations, policies, and procedures at payment centers, shippers, consignees, MTMC, and General Services Administration (GSA).

Conceivably, the process of changing local, departmental, and Federal regulations could be lengthy and complex. We believe that the Joint Service/Agency Users' Group along with the EDI Program Office should take the lead on this task. The specific activities required by this task are shown in Figure D-5.

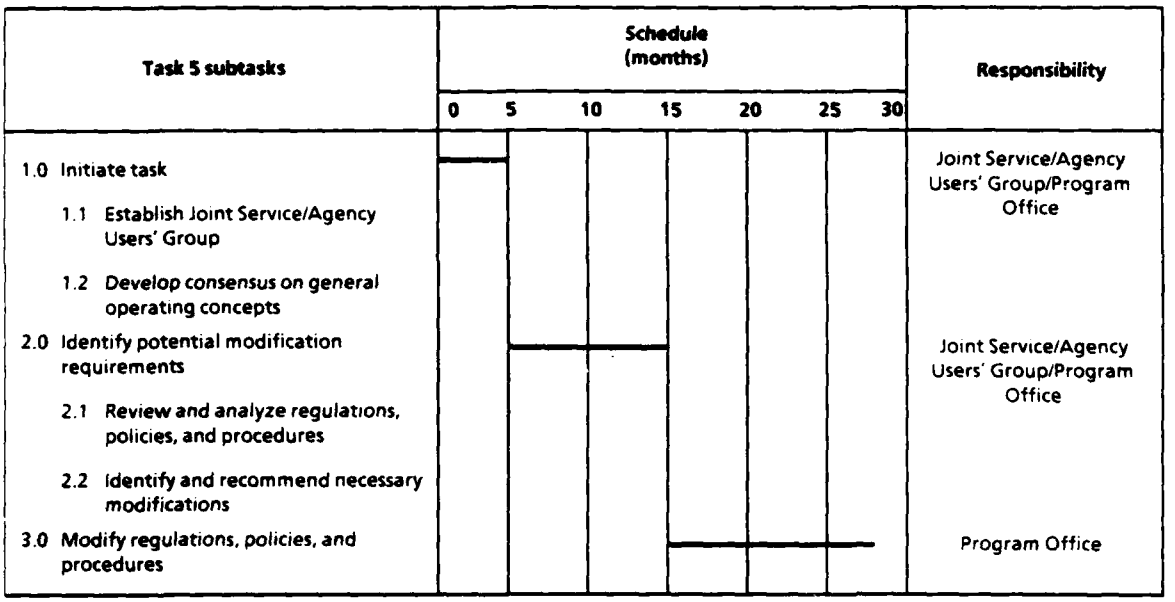


FIG. D-5. WORK PLAN FOR TASK 5: RESOLVE REGULATION, POLICY, AND PROCEDURE ISSUES

Initiate Task

The Joint Service/Agency Users' Group develops a consensus (in conjunction with the EDI Program Office) on what needs to be done and who should take the lead.

Identify Potential Modifications

This subtask encompasses the review and analysis of current regulations, policies, and procedures and the identification and recommendation of necessary modifications.

Modify Regulations, Policies, and Procedures

This subtask includes the actual process of modifying regulations, policies, and procedures. The procedure for the modification process must be determined by the Joint Service/Agency Users' Group.

TASK 6: DEVELOP MTMC AND GSA EDI APPLICATIONS

Developing EDI applications software at MTMC and GSA, in coordination with that in place at the 145 DLA and Military Service shipping points, will increase substantially the productivity gains to be realized from the EDI program. MTMC needs to develop the capability to receive shipment information electronically and use that information for reviewing the performance of shipping activities and for compiling a Freight Information System database. In addition, MTMC needs to install a rate retrieval application system and develop the capability to electronically send rate information to the payment centers.

GSA needs to develop the capability to receive shipment information electronically, perform the postpayment audit function, and send collection messages to the payment center electronically for adjusting carriers' accounts.

This task is divided into five subtasks as shown in Figure D-6.

Initiate Task

MTMC and GSA must separately undertake the development of their own EDI applications coordinated through the EDI Program Office. Both MTMC and GSA should establish a systems development task force to accomplish this subtask.

Other Subtasks

Activities that comprise subtasks 2.0, 3.0, 4.0, and 5.0 are the same as those shown for Task 2 and are as described under that task.

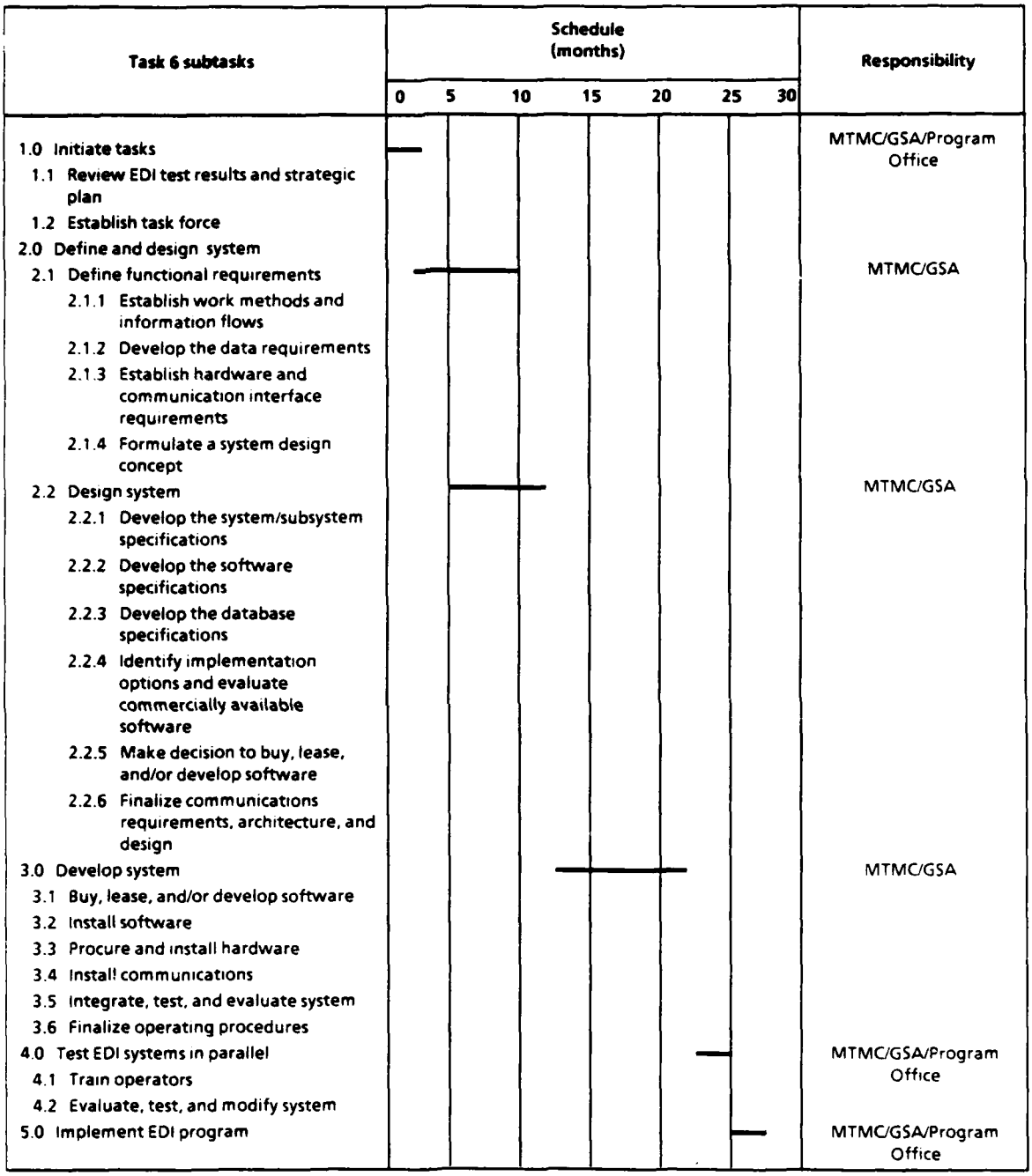


FIG. D-6. WORK PLAN FOR TASK 6: DEVELOP MTMC AND GSA EDI APPLICATIONS

APPENDIX E

COMMUNICATIONS NETWORK DESIGN

This appendix presents the findings of our research into the communications network design for a short-term DoD Electronic Data Interchange (EDI) program. These findings support the conclusions and recommendations presented in Chapter 3. In DoD's short-term EDI program, the communications network design consists of two major components: communications and network services.

COMMUNICATIONS

In the EDI context, communications is the process of physically moving information from one computer to another. The design of a communications network is complicated by differing user requirements and by the numerous technical choices to be made in data transmission standards and types of communication lines. Numerous commercial suppliers and DoD's proprietary packet switching network, the Defense Data Network (DDN), each with varying degrees of resources and experience, must be considered. In addition, since the Military Services and Defense Logistics Agency (DLA) are at different stages of compliance with the Defense Communications Agency's (DCA's) mandate on use of the DDN, multiple networks will have to communicate with one another.

Data Transmission Standards

Data transmission standards can be asynchronous or synchronous [or bisynchronous, as coined by International Business Machines (IBM)]. Asynchronous transmission means that characters move one at a time at irregular rates. Communications equipment can identify individual characters of information by special start and stop elements (bits) appended to each character. The methods by which communications equipment identifies characters is referred to as a protocol. Asynchronous transmission has traditionally had no error-detection protocol and consequently has been used for low-speed [300, 1,200, or 2,400 bits per second (bps)], terminal-to-terminal or terminal-to-computer transmission with 10-bit characters including start and stop bits. More recently, however, error-detecting communication protocols have been developed for low-speed transmission, with the most

common being 2,400 bps. Blast, Kermit, Crosstalk, Xmodem, X.pc, and Microlink are a few examples of error-detecting protocols that are now available. Since the modems used to transmit asynchronously are generally cheaper, asynchronous communications software is frequently used on microcomputers. Asynchronous communication is typically recommended when transmission volume is low and speed not essential as would be the case for DoD's smaller shippers.

Synchronous transmission is a method of transferring information by sending blocks of data. The sending and receiving hardware works in unison to time the signals being transmitted, and individual characters of information are identified by means of a regularly pulsed clock. Data transmitted using the synchronous procedure appear on the communications line as a serial flow of binary digits. Generally, synchronous transmission has been high speed (4,800, 9,600, 14,400, or 19,200 bps), using error-detection techniques and 8-bit characters. IBM 2780/3780, Hasp, SDLC, SNA, and X.25 are typical synchronous protocols. Since error detection is more reliable, synchronous communication is recommended for high-volume transmissions, such as required by large shippers or payment centers.

Types of Communications Lines

Data are transmitted over switched (dial-up) and leased (dedicated) communications lines. Switched lines have a two-wire configuration that is used commonly for low-speed transmission. Its cost is based on terminal connect time and distance of transmission. Private telephone lines and Wide Area Transmission System (WATS) lines are examples. Leased lines have a four-wire configuration and are used for high-speed communications. Special leased lines can accommodate speeds as high as 56,000 bps. The cost for these lines is based on distance and the number of telephone company networks crossed; and it is usually charged at a fixed rate per month. Data transmission volume, speed, and frequency requirements dictate telecommunications network design. Communications line analysis is important when considering the best method of entry into the DDN for DCA mandate compliance.

Defense Data Network

DDN is the proprietary telecommunications supplier for DoD. It is a good communications packet-switching network with excellent security; however, it requires extensive advance notice before network enhancements can be made. In addition, it does not satisfy requirements for EDI network services. The DDN's

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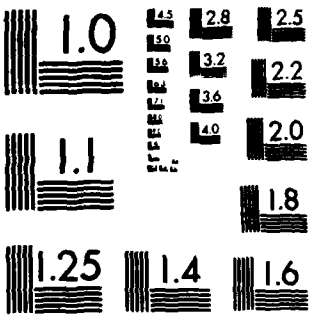

pricing structure is also changing. Currently, a fixed charge is allocated to all Military Services. Beginning in 1990, however, DDN will charge a fixed amount per month for each node connection plus a variable charge on volume.

Most commercial communication networks have established gateways – systems that permit communication between networks – for connecting to DDN. A gateway connection between DDN and some public networks, based on the common protocols X.25 and X.75, is technically feasible but has not yet been implemented.

Summary

Communications support for the EDI program will involve users with different equipment, locations, usage, and requirements. The best approach for immediate and future service is to categorize EDI users by their communications requirements and design a network that will support the EDI program regardless of equipment type, location supported, and usage. Because of the complexity of such a design, communications experts from the Military Services and DLA should define the communications requirements and coordinate compliance with DDN. Commercial communications can be utilized in the interim while DDN compliance is pursued.

NETWORK SERVICES

Network services are services established by communications networks to support EDI. These communications networks are sometimes referred to as value-added networks (VANs).

Type of Services

The requirement for centralized distribution supports the need for network services: document handling and distribution, communication compatibility, administration, customer service, and security.

Document Handling and Distribution

Document handling and distribution services can include mailbox deposit, header control, and batch sequence control.

Mailbox Deposit. Mailbox deposit – the retrieval, storage, and forwarding of documents – is the backbone of network services. EDI methodology suggests that shippers send transaction sets (documents), regardless of their destination, grouped

into a batch to a VAN. One job of a VAN is to sort the transaction sets by destination and deposit all documents with a similar destination into separate computer files called mailboxes.

Header Control. Header control is necessary when trading partners do not accept standard headers. Currently, some rail carriers will not accept the Transportation Data Coordinating Committee (TDCC) header format; therefore, any transactions passing between the networks supporting those rail carriers and any other network must have their standard headers modified. The VAN provides that modification.

Batch Sequence Control. Batch sequence control is the use of sequential numbers to account for transaction sets and protect against lost documents. This service may be especially valuable to assist payments centers in complying with prompt payment regulations. Invoices that are transmitted out of sequence to a payment center from a carrier will trigger a warning to the payment center to investigate the problem.

Communications Compatibility

Communications compatibility is another basic service most VANs provide. Public VANs have been geared to handle variability in user communications.

Administration

Administration is required to set up trading partners and ensure that the cost allocation structure is correct. In addition, VANs accumulate transmission statistics to establish an acceptable audit trail.

Customer Service

Customer service includes implementation/testing, training, and problem solving. Large network vendors tend to invest large sums in customer-service resources. The services vary widely from 24-hour hot-line service to seminars designed to educate and attract trading partners.

Security

Security includes backup, recovery, password protection, and encryption. Most commercial network vendors offer backup, recovery, and password protection as part

of normally accepted practices. Sensitivity of information is an issue that is more difficult to deal with. In a computerized world, information is easy to accumulate especially if that information passes through a centralized point; it is also easy to deny access to that information by the use of passwords. Encryption, however, complicates the issue of security, particularly for information passing through a commercial VAN. Encryption suggests a requirement that in order for standard headers and some data elements to be validated as part of the VAN service they need to be decipherable, with all other data remaining encrypted. Some of the larger commercial network vendors claim that they can satisfy such encryption requirements; however it is not widely practiced.

Summary

VANs provide a wide range of services. Some are common, such as mailbox deposit, communications compatibility, administration, and customer service; others are custom designed to meet the user's requirements, including header control, batch sequence control, and security. The requirements for network services need to take into consideration the cost of providing those services, particularly as it impacts overall network design.

Economic Analysis for Providing Network Services

To provide the network services required by DoD's EDI transportation program, DoD can either develop and operate its own VAN or it can lease those services from a vendor.

We estimate that for DoD to operate a proprietary VAN, a full-time staff of 7 to 11 persons will be required – 3 computer operators responsible for around-the-clock service; 2 to 4 technical support staff members responsible for maintenance and enhancements, backup and recovery, communications, parallel testing, and technical problem solving; and 2 to 4 application support staff members responsible for customer service, administration, and training.

During the short term, we believe that economics favors DoD leasing public network services, thereby minimizing program startup risks. The results of our economic calculations are shown in Table E-1.

TABLE E-1

ECONOMIC ANALYSIS FOR PROVIDING NETWORK SERVICES

($000)

	Alternative 1 own		Alternative 2 lease	
Installation cost (software purchase or development – assumes use of existing mainframe)	400		0	
Annual operating cost	**1990**	**1993**	**1990**	**1993**
Fixed mailbox cost[a]	0	0	47	63
Variable distribution cost[a]	0	0	234	245
Operators				
3 staff members	150	150		
Technical support				
2 staff members	100			
4 staff members		200		
Application support				
2 staff members	100			
4 staff members		200		
Total	350	550	281	308

[a]See Appendix G, "Program Investment Analysis," Tables G-4 and G-5.

Communication Network Service Suppliers

We also met with a number of commercial communication network suppliers, representing a wide range of services and market approaches, for purposes of evaluating their capability to support DoD's EDI network design requirements. Those supplies are listed below:

- McDonnell Douglas (Tymnet)
- General Electric Information Services Company (GEISCO)
- General Telephone and Electronics (GTE) (Telenet)
- Sterling Software (formerly Informatics)
- IBM Information Services

- Control Data Corporation (CDC)
- Kleinschmidt (division of SCM Corporation)
- TranSettlements, Inc.

General Findings

In assessing the capability of potential supplies of DoD network services, we examined document handling and distribution, customer service and security, and cost.

Document Handling and Distribution

Seven of the eight vendors provide document handling and distribution services; those same seven are also willing to customize other services such as header control or batch sequence to meet customer requirements. The range of specific EDI experience among the vendors, however, is wide. Some only have electronic mail experience; some have limited EDI industry or functional experience such as handling purchasing standards or transportation standards; and some have expanded full-line EDI experience.

Customer Service and Security

Customer service and security appear to be related to the size and capital investment commitment of a vendor. The larger vendors are more committed to customer service; they also have more technical resources to apply to such security issues as encryption.

Cost

Full-service communication network companies – those that supply telecommunications as well as network services – tend to be more expensive than other network service suppliers. Perhaps some of the companies are using price to gain a foothold within the industry. However, full-service companies can be very competitive as volume increases.

Supplier Evaluation

Findings

McDonnell Douglas ranks high as a potential provider of network services. It is a full-service supplier with a good packet-switching telecommunications network, and it is strong in all aspects of value-added services. The company has good capital backing and appears to be committed to future EDI investment. Its document handling and distribution software can be purchased or utilized as a service. Its current management philosophy is not to diversify into translation software; for that service, it provides a qualified list of vendors.

GEISCO is another strong contender. It is a full-service company with strong capital backing and a management commitment to EDI. It offers a good packet-switching network and it is strong in all aspects of VAN services. GEISCO believes one of its strongest points is attention to EDI support and customer service. It offers an online administration software package that eases the burden of trading partner setup and cost allocation. It appears to be diversifying even further in EDI with a recent announcement offering online mainframe translation software for shipment information (TDCC 204) and freight invoicing (TDCC 210) at competitive prices. It qualifies and provides a list of microcomputer translation software vendors.

GTE is one of the strongest commercial companies in telecommunications. It has combined Uninet and Telenet networks under US Sprint and is aggressively converting to fiber-optic technology. It has recently announced its intention to join in a business relationship with TranSettlements and Sterling Software to enhance its EDI document handling and distribution capabilities.

Kleinschmidt specializes in offering translation and document handling services to the freight carrier industry. It does not market packet-switching telecommunications; communication service to Kleinschmidt's VAN must be provided through other companies' services.

TranSettlements was founded to take advantage of the EDI movement. Its business has been primarily in mainframe translation software and EDI network services. It has provided recent access to Telenet's packet-switching telecommunications network. It holds a significant market share of carriers transmitting freight

invoices (TDCC 210) through its network and some of the more respected names on the shipper side.

Sterling Software supplies order processing and purchasing services by telecommunications to the drug and hardware industry. While it has experience with EDI from a purchase order perspective, it is working towards gaining experience in EDI within transportation. In addition, it recently announced access to GTE's Telenet packet-switching network.

As part of IBM's corporate philosophy, IBM Information Services has expanded its information services division into EDI. It has a packet-switching telecommunications network, but that network is less extensive than those of other full-service suppliers. It seems to have strong capital backing and a commitment to future EDI investment; furthermore, it has experience with messaging and purchase order EDI and is working towards gaining specific EDI transportation experience. It markets other companies' microcomputer translation software while developing its own, and it offers a qualified list of mainframe translation software vendors. Its EDI products and services lean towards supporting IBM's line of computers, especially insofar as communications protocols are concerned.

CDC is marketing an "intelligent gateway processor," which is software designed to establish communication connections with different computer types through alternate available paths such as local access, WATS, leased lines, or other networks. CDC was not evaluated as a contender supplier for telecommunications or EDI value-added services.

Conclusions

Several communication network suppliers offer a wide variety of services and approaches in the marketplace, presenting opportunities for DoD to mix and match commercial and DDN services to best fit its EDI requirements.

The EDI communication network services industry is in its infancy. It will, however, become highly competitive as additional companies enter the market and the product services of other companies mature. Large, well-capitalized suppliers appear to be moving towards horizontal diversification, expanding into other services such as translation software at competitive prices to attract business. This

should tend to lower commercial network services' prices, thereby strengthening our lease recommendation throughout the short-term program.

NETWORK DESIGN

An understanding of the information flow in any business area is critical to the design of a communications network. That understanding must extend to the information flow characteristics: origins, destinations, frequencies, volumes, and missions of the network. Those characteristics, in conjunction with transmission economics, dictate whether direct distribution, e.g., trading partner to trading partner, should be used in network communications design or whether centralized distribution, i.e., trading partners to a VAN for batch storage and forwarding of transmissions, should be used. An information flow environment in which several information senders communicate with several receivers of the same information generally justifies a centralized distribution design. Centralized distribution design has at least four key benefits in DoD's short-term EDI program:

- It minimizes costly and time-consuming telephone call-back exchanges.
- It reduces the requirements for providing security access to DoD computers for each carrier.
- It provides better control of information flow between trading partners.
- It provides an easy link to other networks.

Since the DoD communications network must be designed to accommodate hundreds of carriers and shippers ranging widely in size, frequency, and volume of information transactions, and since information from carriers will flow through other third-party networks, we believe that a centralized distribution design will be the most appropriate for DoD.

The network design concept must be flexible enough for carriers to transmit to the DoD-specific public VAN directly or through a carrier network. It must also provide the flexibility for both high- and low-volume, non-DDN shippers, as well as current DDN shippers, to access the VAN since shippers are at different phases of

compliance with DCA's DDN mandate. The need for this flexibility suggests a requirement for DDN to interface with a DoD-specific commercial VAN. A network design concept presenting some of these alternatives is shown in Figure E-1.

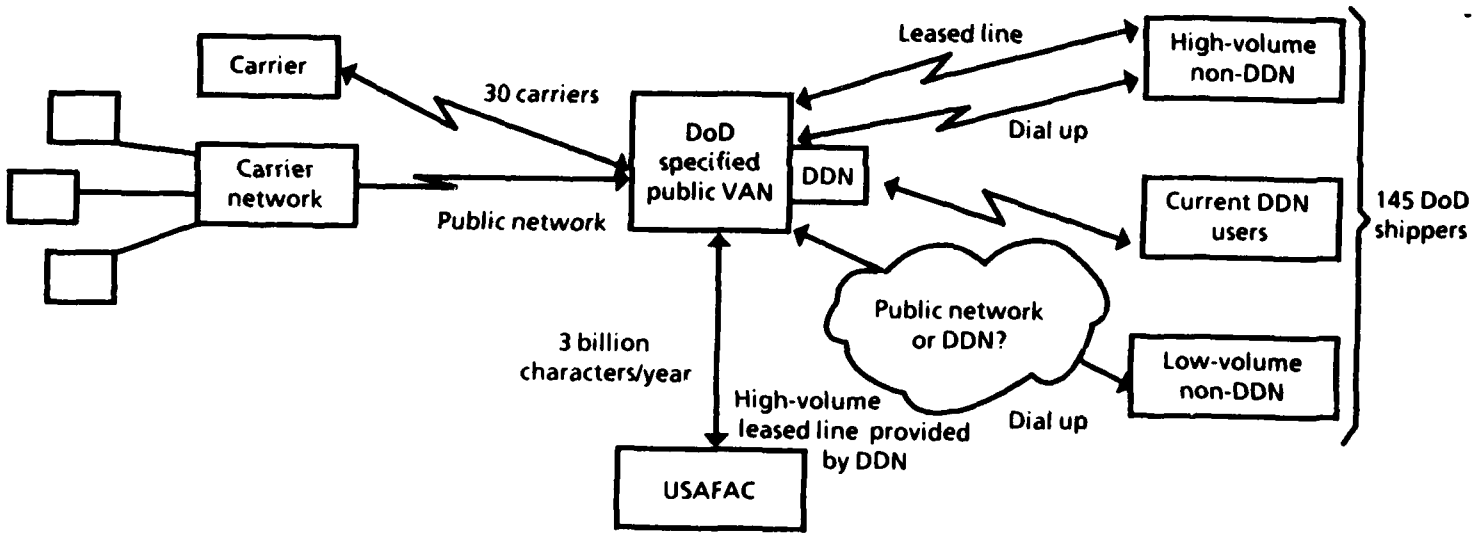

FIG. E-1. NETWORK DESIGN CONCEPT

APPENDIX F

BUSINESS CONVENTIONS IN THE ELECTRONIC EXCHANGE OF GOVERNMENT BILL OF LADING INFORMATION

The growth of standards for the computer-to-computer exchange of business information has prompted commercial transportation companies, along with companies in other industries, to develop new ways of doing business in a paperless environment. Electronic business conventions dealing with issues such as authentication, contract formation, security, evidence, and negotiability have emerged from those efforts. DoD needs to solve these same issues in the course of developing a long-term program to electronically exchange Government bill of lading (GBL) and other business information. This process will be influenced directly by General Accounting Office (GAO)-administered regulations for auditing and General Services Administration (GSA)-controlled procedures for use of the GBL.

In this appendix, we briefly describe how the private sector has solved these issues and then identify some of the key Federal procedures and regulations that will affect the electronic exchange of GBL information.

- *Authentication.* The standard convention for authenticating documents in paper-driven systems is the signature. In some countries, replacement of the signature with electronic transmission conventions is a challengeable legal technicality, and in others, merely an issue of users agreeing on new authentication conventions. In the United States, a signed bill of lading is not a legal requirement. As a result, shippers, carriers, and other transportation companies have agreed to replace the signature with new terms for authentication, such as codes, passwords, and addresses for electronic transmission. It is possible that electronic authentication could reduce the incidence of fraud by eliminating the possibility of forged signatures.

- *Contract Formation.* Currently, contractual terms are commonly preprinted on the reverse side of each bill of lading. This information cannot feasibly accompany each transaction in an electronic environment. As a solution, private-sector companies preserve the terms of the bill of lading by referencing prenegotiated terms with standard codes. This same approach is available to DoD. Furthermore, while manifest information should accompany the freight to destination, it does not have to be an original bill of lading.

- *Security.* In electronic data exchange, security is largely a technical issue. Consequently, industry executives expect electronic transmission technology to reduce the incidence of information loss, destruction, or modification, as well as unauthorized access. In the event of a breach of electronic security, issues of liability are being settled by contractual agreement between the service company and users and/or through insurance.

- *Evidentiary.* The validity of computer data is frequently decided by a contract between users. In issues of litigation, the evidentiary competence of electronic data has been upheld in the courts of some states. In addition, Federal rules do not restrict electronic data as long as the information complies with all requirements of the corresponding document and is used by a company in the course of its regular business. Furthermore, electronic data are subject to the same legal retention periods as corresponding documents. Finally, the use of electronic data for normal business transactions, such as the exchange of invoice, payment, and shipment information, improves the availability and timeliness of relevant information over conventional systems.

- *Negotiability.* The issue of negotiable bills of lading in electronic data exchange is especially important in the private sector where many types of bills of lading are used as credit documents to trade and sell goods during transportation. While the GBL is not negotiable in the same manner as commercial bills of lading, the original GBL must be presented for the carrier to receive payment. The issue of GBL negotiability hinges on DoD acceptance of electronic shipment information in place of the original GBL to support payment of carrier freight bills. The validity of electronic shipment information may be established by contractual agreement with commercial carriers and by changing DoD transportation policy to include electronic images as valid substitutes for the original GBL.

Private-sector experience proves that commercial industry barriers to electronic data exchange are surmountable. The key issue for DoD is how to best effect changes to Federal regulations for the use and audit of GBLs in order to develop new ways of doing business in an electronic data exchange environment.

The GAO is responsible for the regulations and standards for the administration of Federal transportation procedures including the use, generation, and auditing of the GBL. In fact, the Defense Traffic Management Regulation, which governs the preparation and use of the GBL within DoD, is directly influenced by those regulations. GAO has delegated the audit, and much of the responsibility for regulating the GBL to GSA, as detailed in Chapter 101 of the Code of Federal Regulations, Title 41, "Public Contracting and Property Management." All deviations from that guidance must first be approved in writing by GSA, including procedures

governing the original GBL used for carrier payment and auditing, as well as all copies.

GAO also maintains general auditing standards for all Government agencies and systems.[1] These standards require that management systems meet six objectives: the automated system must carry out management policy, provide clear audit trails, include necessary controls to protect against information loss or error, operate efficiently and economically, meet legal requirements, and provide adequate system documentation. In addition, evidence for audit information must be sufficient, competent, and relevant so that the auditor may make reasonable judgments and conclusions. While these audit standards do not preclude the use of electronic information, they require that evidence take any of four forms: physical, testimonial, documentary, or analytical. It is not clear whether an electronic image of a GBL or a document printed from stored electronic data meets those evidentiary requirements.

While Government policy does not prohibit electronic data exchange, many regulations, such as Chapter 101 of the Code of Federal Regulations, provide specific rules for operating in a paper environment. A long-term DoD electronic data exchange effort must contend with many procedural and administrative hurdles before new electronic ways of doing business, such as those developed in the private sector, may be adopted.

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[1]Comptroller General of the United States. *Standards for Audit of Governmental Organizations, Programs, Activities and Functions*. (Washington, D.C.: United States General Accounting Office, 1981 Revision).

APPENDIX G

PROGRAM INVESTMENT ANALYSIS

This appendix presents a detailed short-term program investment analysis that focuses on upgrading the electronic processing capability of the U.S. Army Finance and Accounting Center (USAFAC), preparing 114 shipping activities for Electronic Data Interchange (EDI), and configuring an EDI communications network.[1] This appendix supports Table 3-4 in Chapter 3 and discusses program savings, operating costs, and investment.

PROGRAM SAVINGS

Program savings may be direct or indirect. Direct savings are those realized through personnel reductions resulting from improved operating methods made possible by upgrading USAFAC's processing systems. Indirect savings are those related to operating in a prepayment audit mode.

Direct Savings

Implementing EDI in USAFAC will create opportunities for three types of personnel cost savings associated with improvements in the following areas:

- Government bill of lading (GBL) processing
- Personal property GBL processing
- General office procedures.

We estimate that 114 personnel positions will be saved at USAFAC if all GBL shipment information is transmitted electronically. Those personnel reductions are broken down as follows:

- Freight bill processing – 71 positions
- Personal property and supplemental bill processing – 31 positions
- Other general office automation processing improvements – 12 positions.

[1]USAFAC pays the GBLs for these 114 shipping points.

The logic for deriving those personnel reductions is based upon the following:

- The Transportation Directorate at USAFAC currently employs approximately 350 personnel.
- Approximately 270 of the 350 are dedicated to GBL processing; the remaining 80 process meal tickets, travel vouchers, and other non-GBL items.
- The personnel affected are those in GS (General Schedule) Grade 2, with direct salaries of $11,000 and fringe benefits of 30 percent, that totals $14,300.
- Each day, USAFAC processes 12,000 bills made up of 9,700 GBLs (5,200 freight, 2,500 personal property, and 2,000 supplemental) and 2,300 non-GBL transactions.

Freight GBL Processing Savings Opportunity

Since 54 percent of all GBLs going to USAFAC are freight bills, we assume that 54 percent of the 270 people, or 146, dedicated to processing GBLs are involved in processing freight GBLs.

Based on private-sector experience in paying a similar volume of freight invoices with approximately 60 people, we believe that freight personnel can be conservatively reduced by 51 percent to 75 people for an overall reduction of 71 people.

Personal Property and Supplemental GBL Processing Savings Opportunity

The same EDI system designed for freight bill processing will accommodate personal property bills. In addition, the Military Traffic Management Command (MTMC), through its Transportation Operational Personal Property Standard System project, is installing the capability to electronically transmit personal property shipment information.

Applying the same savings rationale to personal property that we used for freight bills, we estimate that a reduction of 63 people is possible in an all-electronic environment (46 percent personal property and supplemental GBL processing $\times$ 270 people $\times$ 51 percent reduction capability). However, since the processing of supplemental GBLs will remain primarily manual, we estimate that half of the 63 people will be retained. Thus, our estimate for personal property and supplemental personnel reduction is 31 people.

Other General Processing Savings Opportunity

The USAFAC upgrade will encompass other office automation efforts which should result in additional personnel savings in the neighborhood of 15 percent as generally experienced by productivity projects of this nature. We, therefore, estimate a savings of an additional 12 people through increased efficiency (15 percent productivity gain × 80 non-GBL processing people).

Direct Savings Schedule

Direct savings will not be generated until the USAFAC upgrade is completed in 1990. Even then, the savings will fall below the estimates calculated previously since only 78 percent of freight GBL shipment information is expected to be transmitted electronically. Table G-1 presents a schedule of estimated direct savings.

TABLE G-1

DIRECT SAVINGS SCHEDULE

	1990	1991	1992	1993
Percent freight GBLs	78	89	89	89
Personnel savings (Base 71)	55	63	63	63
Percent personal property GBLs			50	100
Personnel savings (Base 31)			15	31
Other personnel savings	12	12	12	12
Total personnel savings	67	75	90	106
Savings ($000) ($14,300 base)	958	1,072	1,287	1,616

Indirect Savings

We estimated the indirect savings potential to be approximately $1.6 million per year.

The logic for deriving that estimate is predicated on the following:

- USAFAC experiences approximately $50 million per year in overcharges.

- Conservatively, 60 percent of those overcharges could be saved through prepayment auditing.
- The overcharges could be "in hand" 8 months (66 percent of a year) sooner through prepayment auditing.
- The cost of money is 8 percent.

The formula for calculating the potential indirect savings is: $50 million × 60 percent reduction potential × 8 percent cost of money × 66 percent of a year which yields $1,584,000 a year. From DoD's perspective, $1.6 million per year in indirect savings is conservative because GSA-recovered overcharges are not returned to DoD, but to the Federal treasury. The actual indirect savings could be as high as $30 million (60 percent of $50 million in overcharges).

Indirect Savings Schedule

Indirect savings are related to the percent of pre-positioned shipment information that can be rated by a computerized rating system such as that expected to be part of MTMC's CONUS Freight Management (CFM) system. However, since MTMC has not yet published an estimated completion date for the CFM, the computerized rating percentages estimated for 1990 through 1993 are subjective. Guaranteed freight rates are most likely to be automated because of their simpler rate structure. Guaranteed freight currently is 30 percent of total shipments and is expected to increase significantly. Table G-2 presents a schedule for estimated indirect savings.

TABLE G-2

INDIRECT SAVINGS SCHEDULE

	1990	1991	1992	1993
Percent automated rating estimate	30	40	50	60
Savings ($000) ($1,584,000 base)	475	637	792	950

PROGRAM OPERATING COSTS

Program operating costs are incurred through network services, telecommunications, and the EDI Program Office.

Network Services and Telecommunications

Network service includes document handling and distribution (mailbox services), administration, and customer service. We believe that these services should be leased to take advantage of public suppliers' EDI experience and also to minimize DoD's risk associated with this program.

Most public network suppliers also offer telecommunications capabilities, i.e., the physical mechanism for transmitting information from place to place. Some of those suppliers have indicated that telecommunications and related charges can be separated from their network services. In that case, DoD can design a network that satisfies the Defense Communications Agency mandate for use of the Defense Data Network (DDN) telecommunications while taking advantage of public vendors' network services experience. We base our investment analysis on the assumption that a public supplier will provide the network services and DDN will provide the telecommunications.

Beginning in 1990, the DDN, like commercial network services suppliers, will base charges for their services on two components: a variable component based on characters of throughput and a fixed component based on the size of a customer's computer, i.e. microcomputer or mainframe. Network services are charged through a variable "distribution" rate that is negotiable and tends to decrease as customer volume increases. Variable charges labeled "in" and "out" are telecommunications-related and should not be paid to a public network supplier if the DDN is used to transmit data. In contrast, DDN imposes two charges: one to move information into the public network supplier's center and a second to move that information out of the supplier's center. The fixed rate for network services is based on the number of microcomputer or mainframe "mailbox" accounts, while that for DDN is based on the number of microcomputer or mainframe access lines into the network.

These operating costs are dependent on the estimated volume of character throughput over the short-term years. Table G-3 shows the estimated transmission character throughput. Table G-4 shows the variable operating costs and the network

services and DDN-estimated variable rates extended by the throughput volumes derived in Table G-3. Table G-5 presents the fixed operating costs based on estimates of the number of microcomputers and mainframes that will be required over the short-term years and extends them by the network services and DDN estimated fixed rates. The total of the variable costs and the fixed costs are shown as network services and telecommunications costs in Table 3-4 in Chapter 3.

TABLE G-3

TRANSMISSION CHARACTER THROUGHPUT

(Between shippers and USAFAC)

	1990	1991	1992	1993
Freight GBL characters @ average 2,000/GBL (billions)	1.826	2.082	2.082	2.082
Personal property and supplemental GBL characters @ average 1,000/GBL (billions)			0.500	1.000
Functional acknowledgment characters @ average 160/GBL (billions)	0.125	0.146	0.244	0.353
Total characters (billions)	1.951	2.228	2.826	3.435

Program Office

The EDI Program Office will be phased in between 1988 and 1990 to support the EDI program implementation. However, the costs of that Office are not included in this analysis since they are incurred in support of the entire EDI program.

PROGRAM INVESTMENT

Short-term program investment, as shown in Table G-6, is divided into three major activities: upgrading USAFAC, upgrading Navy and Marine Corps payment centers, and developing automated systems at MTMC and General Services Administration (GSA). Upgrading the payment centers includes upgrading operations systems, installing EDI capability at shipping points, and installing the communications network.

TABLE G-4

VARIABLE OPERATING COSTS

(In dollars)

	1990	1991	1992	1993
Network services				
Public vendor average distribution charges per 1,000 characters at specified level of volume estimate	0.12	0.11	0.09	0.07
Distribution charges (000)	234	245	254	240
Telecommunications				
DDN telecommunications charges per 1,000 characters in and out of network service supplier	0.019	0.019	0.019	0.019
DDN telecommunications charges (000)	37	43	54	66

TABLE G-5

FIXED OPERATING COSTS

	1990	1991	1992	1993
Estimated number of microcomputers (USAFAC shippers)[a]	14	67	67	67
Estimated number of mainframe computers[a] [USAFAC shippers, USAFAC (1), network service supplier (1)]	18	18	18	18
Public vendor network services fixed cost @ $300 per microcomputer and $2,400 per mainframe mailbox per year ($000)	47	63	63	63
DDN fixed cost @ $5,400 per microcomputer and $20,400 per mainframe per year (assume 50 percent of mainframe DDN charges are shared by other initiatives)	259	545	545	545

[a]Assumes Defense Contract Administration Service's (DCAS's) 31 activities are funded through the Transportation Automated Management System (TRAMS) initiative.

TABLE G-6

SHORT-TERM PROGRAM INVESTMENT

Major activities	Estimated funding requirements ($000)				
	1988	1989	1990	1991	Total
Upgrade USAFAC					
Upgrade operations systems	300	450	50		800
Install EDI capability at DLA[a], Army, and Air Force shipping points		850	655		1,505
Install communications network		90	159		249
Total	300	1,390	864		2,554
Upgrade Navy and Marine Corps Payment Centers					
Upgrade operations systems			400		400
Install EDI capability at Navy and Marine shipping points			330	135	465
Install communications network			66	27	93
Total			796	162	958
Develop automated systems at MTMC and GSA		500			500
Total	300	1,890	1,660	162	4,012

[a]DLA = Defense Logistics Agency.

Upgrading Payment Centers Operations

The USAFAC operations system upgrade is divided into two phases: definition and design, and program development and installation. We expect that approximately $300,000 will be required in 1988 for definition and design. The remaining $500,000 will be directed towards system development and installation, spread over the 1989 – 1991 timeframe.

Upgrading operations systems at the Navy and Marine Corps payment centers will follow the USAFAC upgrade. It is expected that much of USAFAC's effort will have the potential to be transferred to the other payment centers.

Installing Shipping Point EDI Capability

The cost of installing EDI capability at shipping points is dependent on the number of mainframe or microcomputer installations, and consists of hardware, software, and installation consulting and training.

Mainframe computers are recommended for activities at which the shipping volume exceeds 15,000 shipments a year or at activities that have similar computer systems to those activities whose volume justifies a mainframe. (Of course, wartime shipping requirements will need to be considered in the final decisions.) As shown in Table G-7, we recommend mainframe computers be used at Defense Logistics Agency (DLA) depots, Air Logistics Centers, Army's Area Oriented Depots, and one large Army depot (Letterkenny with 25,000 shipments a year). Mainframe investment costs are based on the assumption that hardware exists, and therefore, the total cost, estimated at $40,000 per installation including a discount for quantity, encompasses software and installation costs.

The cost for a microcomputer application, including hardware, software, and installation, is estimated at $15,000 per installation including a discount for quantity.

The Army TC ACCIS initiative is automating GBL processing at selected Army activities. Since that initiative already has funded microcomputers at those activities, we estimate that the cost of making those activities EDI capable is $5,000 per installation, principally software and installation, including a discount for quantity.

The total cost to install EDI capability at the 114 largest USAFAC shipping points, between 1989 and 1990, and at the 25 largest Navy shipping points and 6 largest Marine Corps shipping points, between 1990 and 1991, is shown in Table G-8.

Installing Communications Network

Communications software required to interface the shippers, payment centers, and a public value-added network (VAN) to the DDN is expected to be approximately $3,000 for each shipping activity. Once again, the total investment cost for installing the communications network is dependent on the estimated number of shipping

TABLE G-7

SHIPPING POINT EDI INSTALLATIONS

Shipping points installed	Number of computers installed				
	1989			1990	1991
	Micro-computer	Main-frame	Total	Micro-computer	Micro-computer
DLA					
Defense depots	7	7	14		
DCAS[a]					
Air Force					
Air Logistics Centers		5	5		
Other Air Force Activities				23	
Army					
Area Oriented Depots		3	3		
Army Depots	7	1	8		
TC ACCIS Activities[b]				14	
Other Army Activities				16	
Total USAFAC	14	16	30	53	
Navy					
Navy Supply Centers				6	
Other Navy Activities				10	9
Total NAVMTO				16	9
Marine Corps Activities				6	

[a]DCAS's 31 shipping activities investment is funded by the TRAMS initiative and not included in this table.

[b]These activities overlap with the top 145 DoD shipping activities.

TABLE G-8

SHIPPING POINT EDI INVESTMENT

	Cost/Unit ($000)	1989		1990		1991	
		No.	Total ($000)	No.	Total ($000)	No.	Total ($000)
Army, Air Force, and DLA							
Microcomputer	15	14	210	39	585		
Mainframe	40	16	640	0	0		
TC ACCIS	5	0	0	14	70		
Total		30	850	53	655		
Navy microcomputer	15			16	240	9	135
Marine Corps microcomputer	15			6	90		
Total				22	330	9	135

points phased in between 1989 and 1991. Table G-9 presents the communications network investment.

Developing Automated Systems at MTMC and GSA

We estimate that $500,000 will be required to develop automated systems at MTMC and GSA which are capable of receiving and processing EDI transactions. This funding will be required in 1989 to ensure that MTMC and GSA fits into the overall program implementation schedule which is focusing on the completion of the USAFAC upgrade.

TABLE G-9

COMMUNICATIONS NETWORK INVESTMENT

	1989	1990	1991
Army, Air Force, and DLA			
Shipping points installed	30	53	
Communications installation ($000) @ $3,000 each	90	159	
Navy and Marine Corps			
Shipping points installed		22	9
Communications installation ($000) @ $3,000 each		66	27

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The use of electronic data interchange (EDI) techniques to transfer transportation information electronically from one computer to another has the potential to greatly enhance DoD transportation operations, including improved productivity, reduced staffing, and strengthened financial control. To launch a comprehensive EDI program, DoD needs a deliberate and thorough long-term program of action. This report presents such a program.

It lays out the structure for DoD to conduct all of its freight movement business transactions electronically. It also identifies the implementation actions that should be undertaken immediately. Those actions include: establishing an EDI Program Office to coordinate DoD's entry into an electronic environment; upgrading the electronic processing capabilities at DoD payment centers; installing EDI capability at DoD's 145 largest shipping activities; coordinating development of automated systems within the Military Services, Defense Logistics Agency, Military Traffic Management Command, and General Services Administration; developing a telecommunications network linking shippers, consignees, carriers, payment centers, and other transportation activities; and modifying Federal regulations and DoD directives and instructions that inhibit conducting business electronically.

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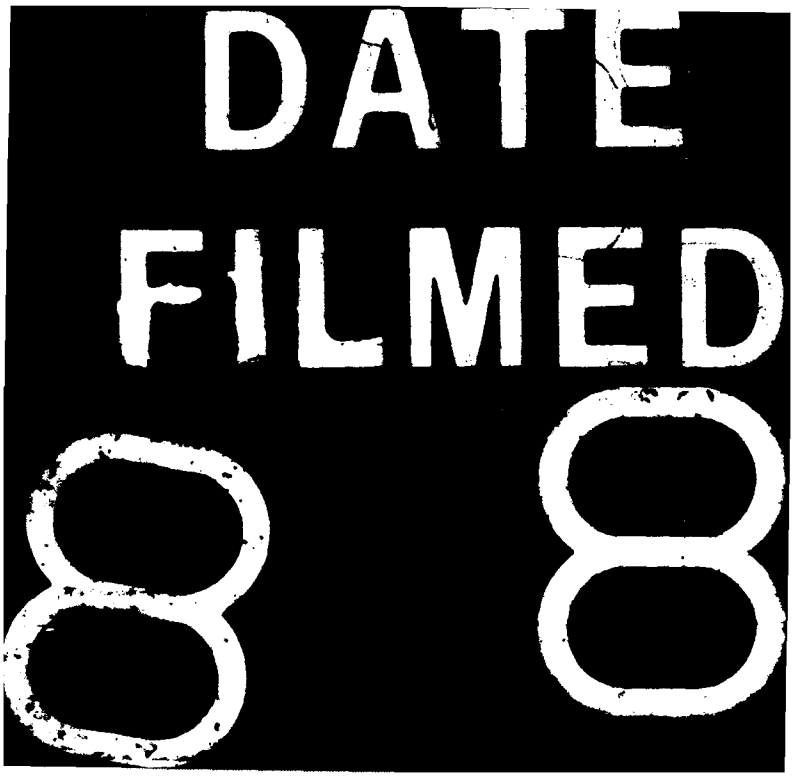
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